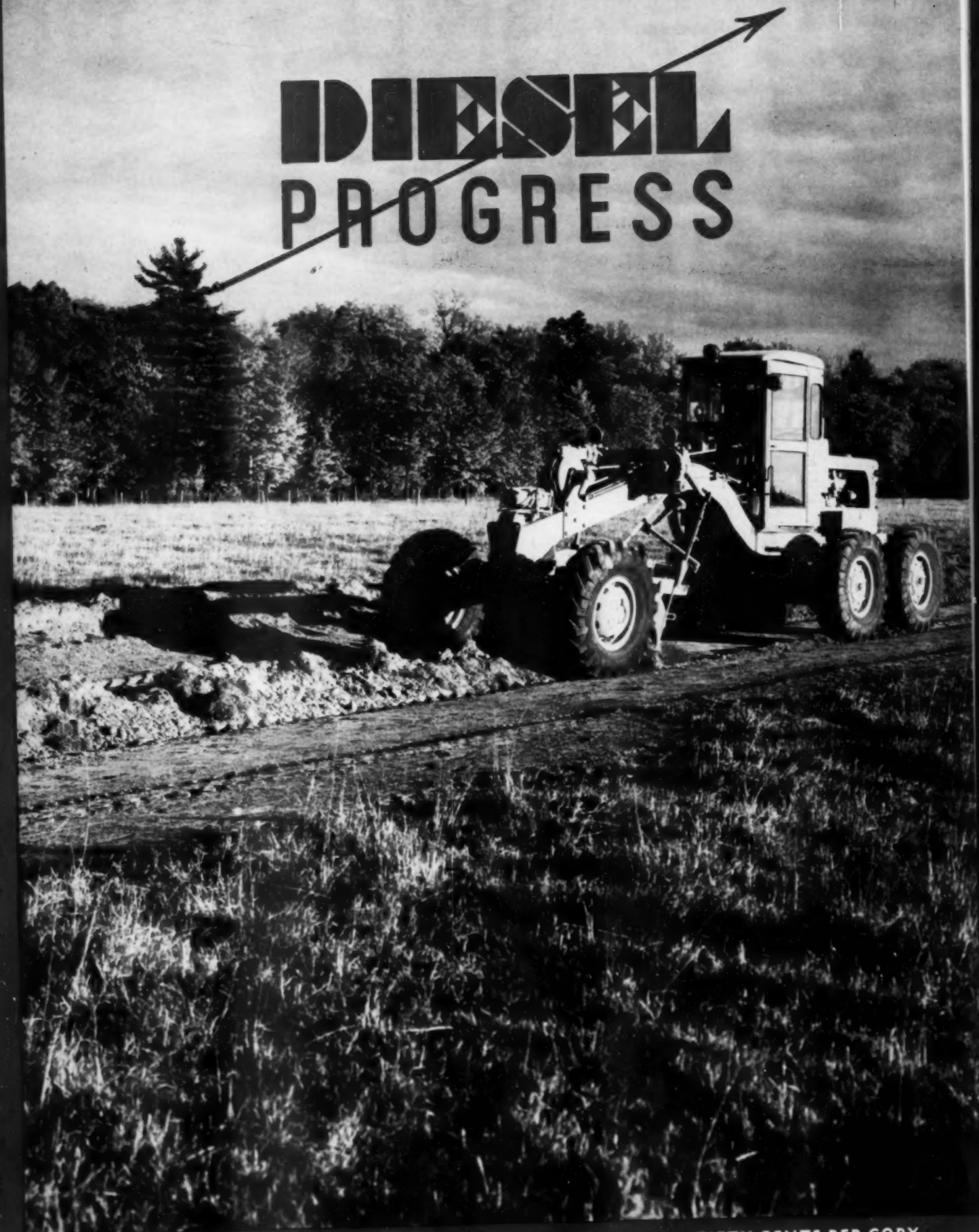
# DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

APRIL, 1952

FIFTY CENTS PER COPY

TUNE IN . . . TEXACO
STAR THEATER
starring MILTON BERLE
on television
every Tuesday night.
See newspaper for
time and station.

TEXACO

TEXACO

DIESEL PROGRESS for April, 1952, Volume XVIII, No. 4. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy, 50c. Acceptance under 34.64, P. L. & R., authorized.

# P RINGS FREE

## ...reduce fuel consumption and maintenance costs

Power plant, Republic Aviation Corp., Farmingdale, N. Y. — lubricated exclusively with *Texaco Ursa Oil.*

## . . . lubricate with TEXACO URSA OIL

You reduce fuel consumption and maintenance costs when you lubricate Diesel, gas or dual-fuel engines with *Texaco Ursa Oil.* Here's an oil that *cleans as it lubricates* — keeps engines in tip-top shape for maximum performance at minimum expense.

*Texaco Ursa Oil* stands up under the toughest operating conditions . . . resists oxidation and the formation of carbon, sludge and gum. Thus, rings stay free, ports stay clear, valves work smoothly. You get better compression and combustion. Fuel consumption comes down. Maintenance costs, too — because *Texaco Ursa Oil* assures smoother operation, less wear.

There is a complete line of *Texaco Ursa Oils.* Leading engine builders approve them, and operators everywhere prefer them. In fact —

*For over 15 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco Ursa Oil than with any other brand.*

Let a Texaco Lubrication Engineer help you get best possible performance from all your engines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

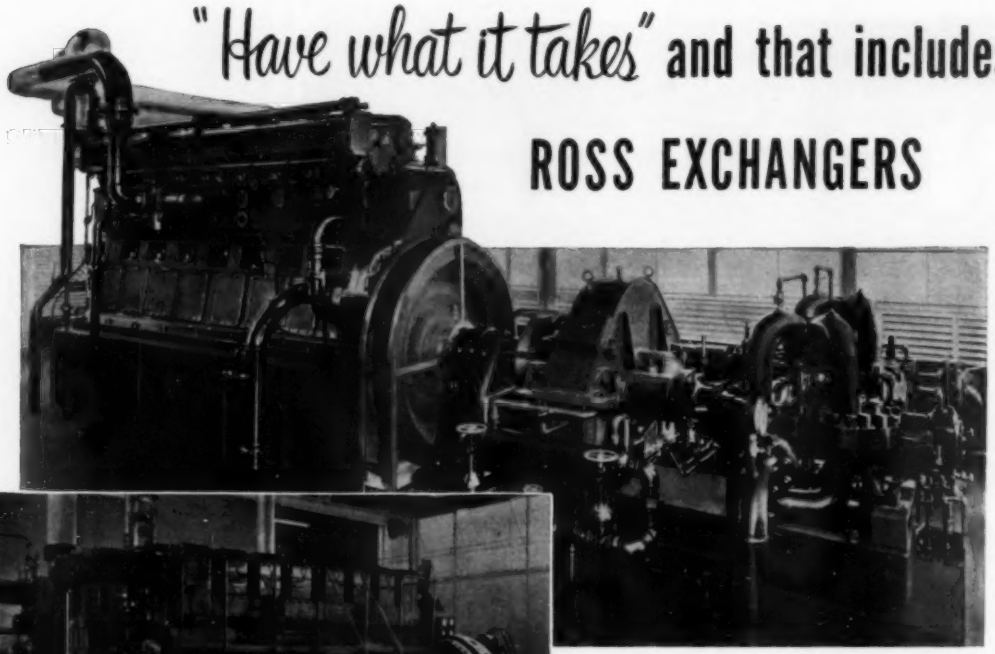
**URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES**

*Faithfully yours* TEXACO 50 *for Fifty Years*

# work-proved Cooper-Bessemer engines

## "Have what it takes" and that includes

## ROSS EXCHANGERS



Cooper-Bessemer JS, 8-cyl., 600 hp gas engine, equipped with Ross Exchangers (not shown), direct-connected to Farrel-Birmingham speed increaser (also Ross Exchanger equipped) on a West Coast crude oil line.

Two Cooper-Bessemer JS, 8-cyl., 688 hp Diesel engines, equipped with Ross Exchangers, driving generators in a Michigan utility.

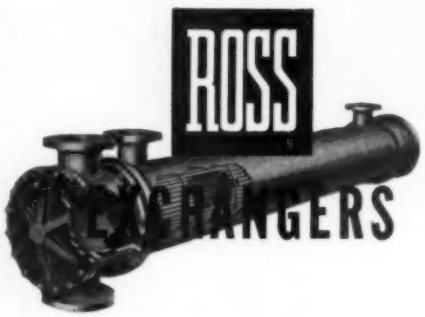
On oil or gas pipelines, in refineries or power generating plants, work-proved Cooper-Bessemer engines and compressors, in the words of their manufacturer, "have what it takes".

. . . and one of the very important things a Cooper-Bessemer Diesel or gas engine *must* have is efficient cooling. Lube oil and jacket water temperatures *must* be maintained at the correct level to assure the "Efficient Power at Lower Cost" which The Cooper-Bessemer Corporation promises.

That responsibility has largely been entrusted to Ross Exchangers. Performance-proved, pre-engineered, fully standardized . . . *they* "have what it takes", too, in the judgment of Cooper-Bessemer's design engineers and Cooper-Bessemer's customers alike.

For meeting *any* heat transfer requirement, there is no better means than furnishing a standardized Ross Exchanger as original equipment. Details in Ross Bulletin 2.1K1. Write.

ROSS HEATER & MFG. CO., INC., Division of American Radiator and Standard Sanitary Corp., 1425 West Avenue, Buffalo 13, N. Y. In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

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AMERICAN-STANDARD · AMERICAN BLOWER · ACME CABINETS · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

# DELCO-REMY

ELECTRICAL EQUIPMENT

## SERVING THE DIESELS THAT SERVE AMERICA . . .

DELCO-REMY—A UNITED MOTORS LINE
Service Parts and Delco Batteries
Available Everywhere Through
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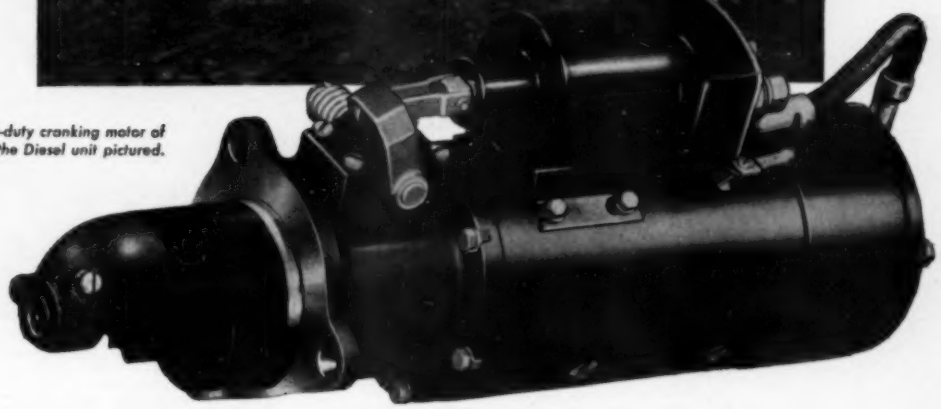


*Delco-Remy heavy-duty cranking motor of the type used on the Diesel unit pictured.*

Diesel engines are to be found in most every industry because of their exceptional power, economy and dependability. And Delco-Remy supplies the electrical equipment needed on many of these Diesels.

In every field where Diesels are used, manufacturers and users alike have come to count on Delco-Remy electrical equipment for outstanding performance. They depend on Delco-Remy to keep their Diesels on the job.

**Delco-Remy**

DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

**DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN**

# Fourteen Years on the Rock Pile

INTERNATIONAL

INTERNATIONAL HARVESTER

POWER THAT PAYS

## Dean Word proves that Internationals stand the gaff on the toughest crushing jobs

**NEW AND OLD INTERNATIONALS TEAM UP FOR CRUSHING PROFIT.** A new International UD-24 and a 14-year-old International engine (left background) power crushing plant that turns out 700 cubic yards of road rock per 8-hour shift for the Dean Word Company of New Braunfels, Texas.

Dean Word Company purchased a new International UD-24 on the record of a 14-year-old International that has been powering their primary jaw crusher for years.

Superintendent Erwin Smith says: "That old International shows the performance that can be built into an engine. It went to work on our crusher in 1937, gets the valves ground or new rings when we get around to it every four or five years, and it runs as good today as when it left the factory. We bought the new UD-24 on the record of the old engine."

Wherever steady, year-after-year power is needed for the heavy crushing jobs, you'll find Internationals in the pit. Your International Industrial Distributor or Power Unit Dealer will be glad to show you several models to fit your power requirements. Find out about his up-to-the-minute repair shops and his full parts stock, backed by a neighboring International Harvester Parts Depot. Get the facts on International *"Power that Pays."*

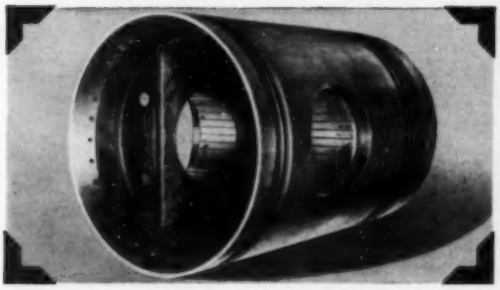
**INTERNATIONAL HARVESTER COMPANY**
**CHICAGO 1, ILLINOIS**

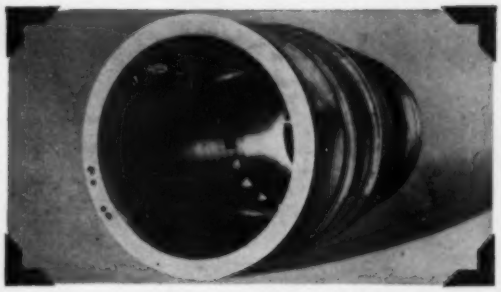
# STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.
UNIT Diesel Locomotive cylinder assembly
SERVICE Mountain Freight
LOCATION Transcontinental freight service on Moffat tunnel + Royal Gorge Routes
PERIOD In excess of 8 years
FIRM Denver & Rio Grande Western R.R.Co.

## One million miles of service on cylinder liners and pistons





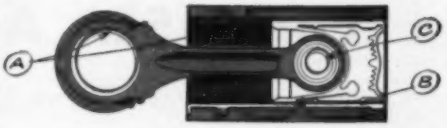
IN SERVICE APPROXIMATELY 1,000,000 MILES in Denver & Rio Grande Western Railroad diesel locomotive engines, this piston and cylinder liner were always lubricated with RPM DELO Oil R.R. At the end of that time wear measurements (inches) were only: Piston Skirt—0.001; Ring Grooves—No. 1—0.003 to 0.006, No. 2—0.002, No. 3 & 4—none; Cylinder liner (maximum diameter)—0.0095, (out of round)—0.002 to 0.004.

RPM DELO Oil R.R. has been the standard on the Denver & Rio Grande Western Railroad for over-the-road freight and passenger locomotives since their first power of this type was placed in service in January 1942. At the time this inspection was made approximately 49,563,104 miles had been traversed by the Rio Grande freight diesel fleet of 100 units and during that period only 77 cylinder liners had been scrapped for any reason. At that time many of the original pistons and cylinder liners were still in service and the average age of all these assemblies, including recently purchased power, was 4.7 years.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM" REG. U.S. PAT. OFF.

### How RPM DELO Oil R. R. prevents wear, corrosion, oxidation




**A.** Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

**B.** Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean... helps prevent scuffing of cylinder walls.

**C.** Special compounds stop corrosion of any bushings or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
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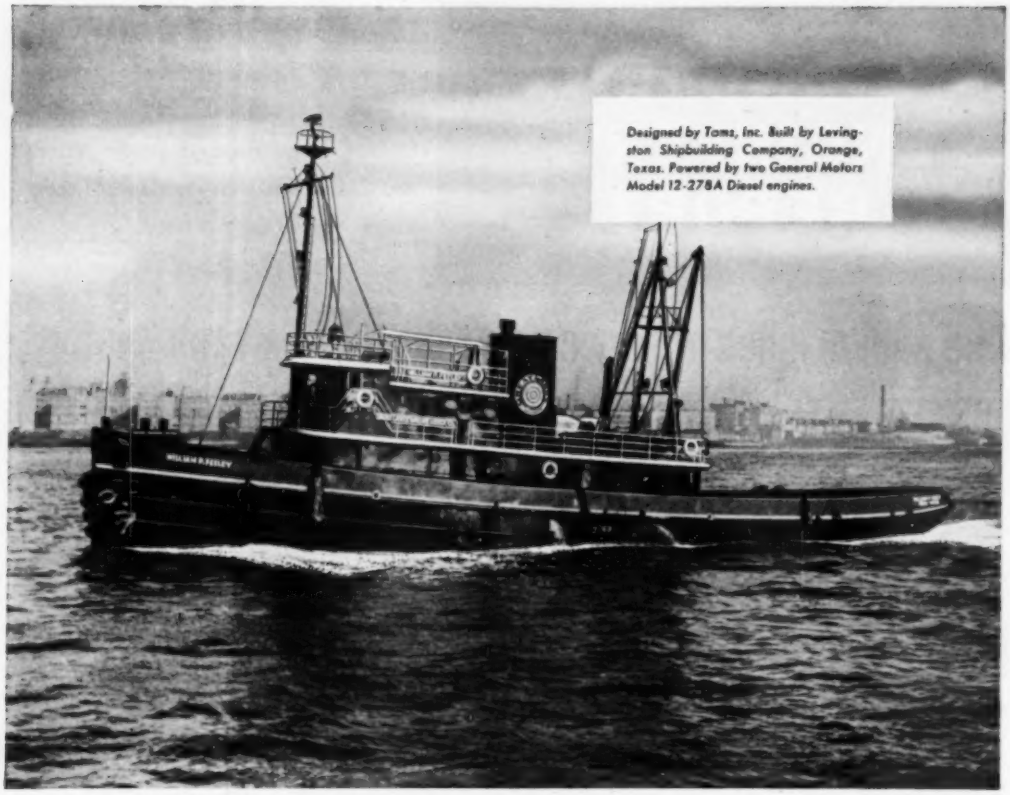

*Designed by Toms, Inc. Built by Levingston Shipbuilding Company, Orange, Texas. Powered by two General Motors Model 12-278A Diesel engines.*

# OPEN SEA AND HARBOR–

*General Motors Diesel-Electric Drive excels*

The "William P. Feeley," ocean-going tug of the Great Lakes Dredge & Dock Company, is in daily service towing heavy barges from New York harbor to the sea. General Motors Diesel-Electric Drive is again the choice for rugged, dependable and economical power in this heavy-duty service.

***No Substitute for Diesel-Electric Drive***

## Cleveland Diesel Engine Division

GENERAL MOTORS • CLEVELAND 11, OHIO

GM GENERAL MOTORS DIESEL POWER

*ENGINES FROM 150 TO 2000 H.P.*

**SALES AND SERVICE OFFICES**

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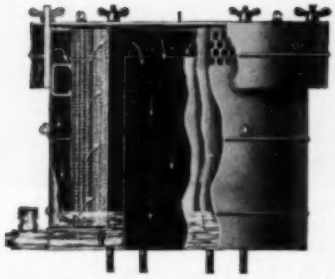
# New Fairbanks-Morse diesel saves plant $2,000 a month . . . gets clean air with Air-Maze filters



**HOW AIR-MAZE** oil bath filter literally "scrubs" damaging particles out of airborne air. Capacities up to 6500 CFM. Multiple units available for larger capacities.

Instead of using fuel oil, this new Fairbanks-Morse 2000 hp. dual-fuel diesel engine uses natural gas which is cheaper. As a result, it saves the Goodland, Kansas, municipal power plant $2,000 a month in fuel costs.

To provide the new engine with maximum protection against airborne dust, Fairbanks-Morse engineers have mounted a 4-unit oil bath Air-Maze filter on the engine's air intake. Air-Maze oil bath filters remove abrasive dust and dirt from the air, prevent costly and troublesome damage to the highly polished pistons, liners and rings of the engine.

With Air-Maze oil-bath filters, intake air is passed through an oil-filled bowl, then through an oil-washed filter media. It comes out "scrubbed" clean.

Leading diesel manufacturers specify Air-Maze oil bath filters and many other types of Air-Maze air and liquid filters for their engines because they know that they make their products last longer, work better, require less maintenance. The Air-Maze Corporation, Cleveland 5, Ohio.

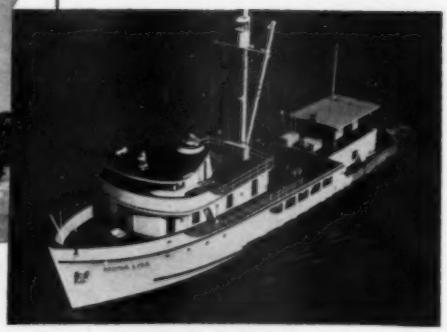
*The biggest names in diesels are protected by Air-Maze filters*

AIR FILTERS
SILENCERS
SPARK ARRESTERS

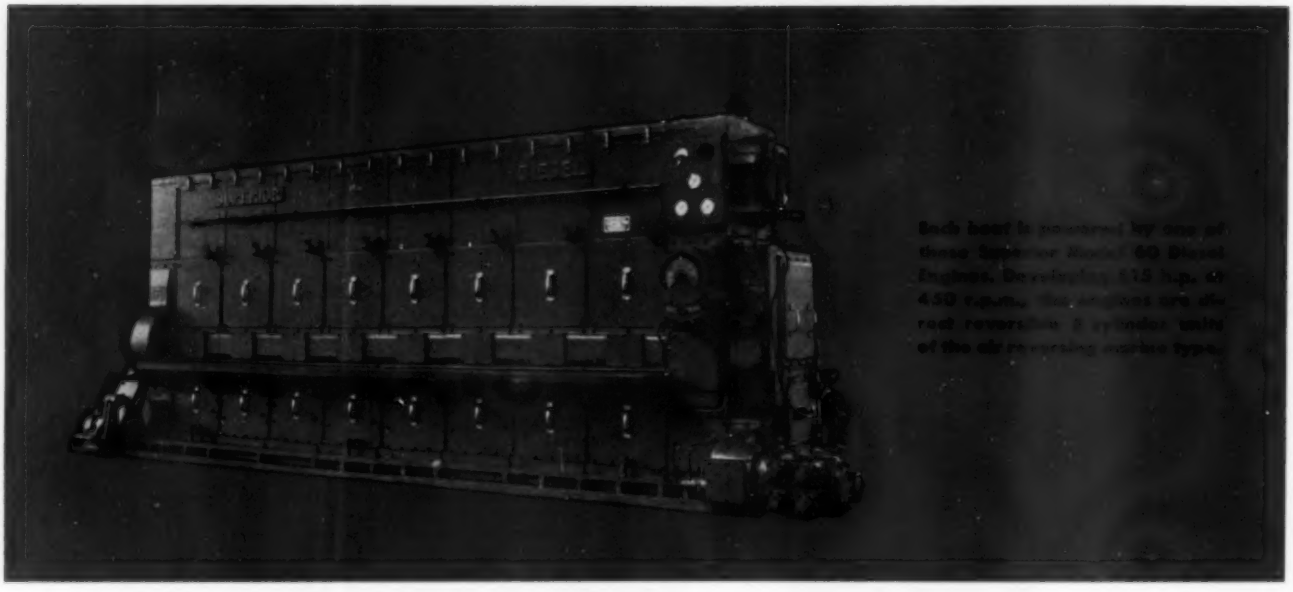
**AIR-MAZE**
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

# New Sister Ships of the TUNA FLEET



# powered by SUPERIOR DIESELS



These two clippers, now fishing with the West Coast tuna fleet, were built by the J. M. Martinac Shipbuilding Corporation at Tacoma, Washington.

They were designed by J. M. Martinac, Sr., and constructed under the direction of J. M. Martinac, Jr. Each boat is 118′ x 26′ x 13′6″ with cargo space for approximately 240 tons of frozen tuna.

Both the "Royal Pacific" and the "Mona Lisa" are powered by Superior Diesels, long established among tuna boat owners and Masters as dependable engines, economical to operate and maintain.

The addition of these two new clippers brings the total of Superior and Atlas Diesel horsepower in the Pacific tuna fleets to a more dominant position in the field where they've been leaders for so long.

It's easy to check up on the performance of Atlas and Superior Diesels in fishing boat service because there are so many of them in operation. Ask any Master or write for a list of users—we'll send you new marine engine bulletins at the same time.

Superior ENGINES

ATLAS Imperial DIESEL ENGINES

DIESEL • DUAL FUEL • GAS

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STANDARD HD
TRADE MARK
OIL

# Solves a fuel problem...

● The Center Municipal Power Plant of Center, Colorado, had a unique fuel problem. Because of the plant's rather remote location in the Rocky Mountains, the cost of transporting diesel fuel to the plant was extremely high. Resourceful Mr. Vail F. Shumaker, superintendent, worked out a plan for utilizing locally produced crude oil as a fuel. The poor burning quality of this fuel, however, led to trouble. Fuel soot was heavy and deposits formed in the plant's four engines. Rings began sticking.

A Standard Oil lubrication specialist was asked for advice. Upon his suggestion, the conventional lubricant used in the diesels was replaced in one engine by STANDARD HD Oil, a truly heavy-duty lubricant containing necessary additives. During the next few months' operation, this engine alone remained clean. It was evidence enough. The other diesels were switched to STANDARD HD. Despite severe operating conditions imposed by the poor burning fuel, STANDARD HD has kept these engines clean and protected during three years of service. It has made possible the use of the locally available fuel and thus effected a sizable saving for this power plant.

This plant's experience indicates how you can benefit through STANDARD HD and the services of a Standard Oil lubrication specialist. You can get those services easily and quickly by phoning your local Standard Oil (Indiana) office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Pleased with performance of STANDARD HD oil are J. J. Tyler of Standard Oil (left) and Vail F. Shumaker, Superintendent of Center, Colorado, Municipal Power Plant, who worked closely together to solve a unique fuel-lubrication problem.

**STANDARD OIL COMPANY**

STANDARD *(Indiana)*

# Cylinder bore wear REDUCED . . 84.6%
# Main bearing wear REDUCED . . 77.9%
# Rod bearing wear REDUCED . . . 93.3%
# Piston wear REDUCED . . . . . 78.4%

## with

# PUROLATOR

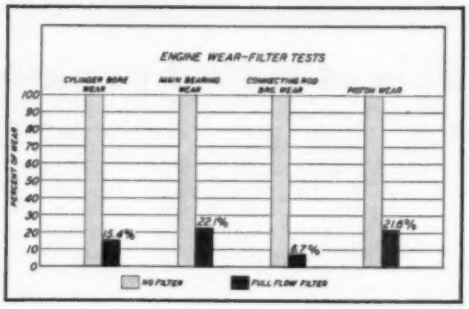
## FULL-FLOW

# MICRONIC FILTERS

THESE ARE THE RESULTS of tests just completed by one of the world's largest automobile and engine manufacturers.

The purpose of these tests was to determine how much the Micronic Full-Flow element reduces wear.

Running standard gasoline engines under extremely adverse conditions, test engineers found that Purolator Micronic* Full-Flow filtration was the best of all tried . . . far superior to any partial-flow filter.




The secret of this amazing performance is the Purolator* *Micronic* Filter Element with *ten times* the filtering area of old-style filters. It is the *only* element capable of delivering full-flow rates during its entire service life, with effective, dependable filtration down to *microns* (0.000039 in.)!

Purolator's Engineering Department will gladly cooperate in helping you adapt super-efficient Purolator Micronic Full-Flow filtration to your own requirements. *Just write!*

*Reg. U. S. Pat. Off.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
Factory Branch Offices:
Chicago, Detroit, Los Angeles

PUROLATOR
MICRONIC OIL FILTER
"FIRST IN THE FIELD OF FILTERING"

# FAIRBANKS-MORSE

## DUAL FUEL POWER SAVING OVER $19,000 A YEAR!

In the western Kansas city of Colby, Fairbanks-Morse Dual Fuel Engine economy has been making savings in fuel and lube oil that amount to over $19,000 annually!

But impressive as it is, that isn't the whole story. For this Model 33 Engine has been the mainstay of the plant—operating more than 96% of the time . . . generating more than 83% of the plant's total load.

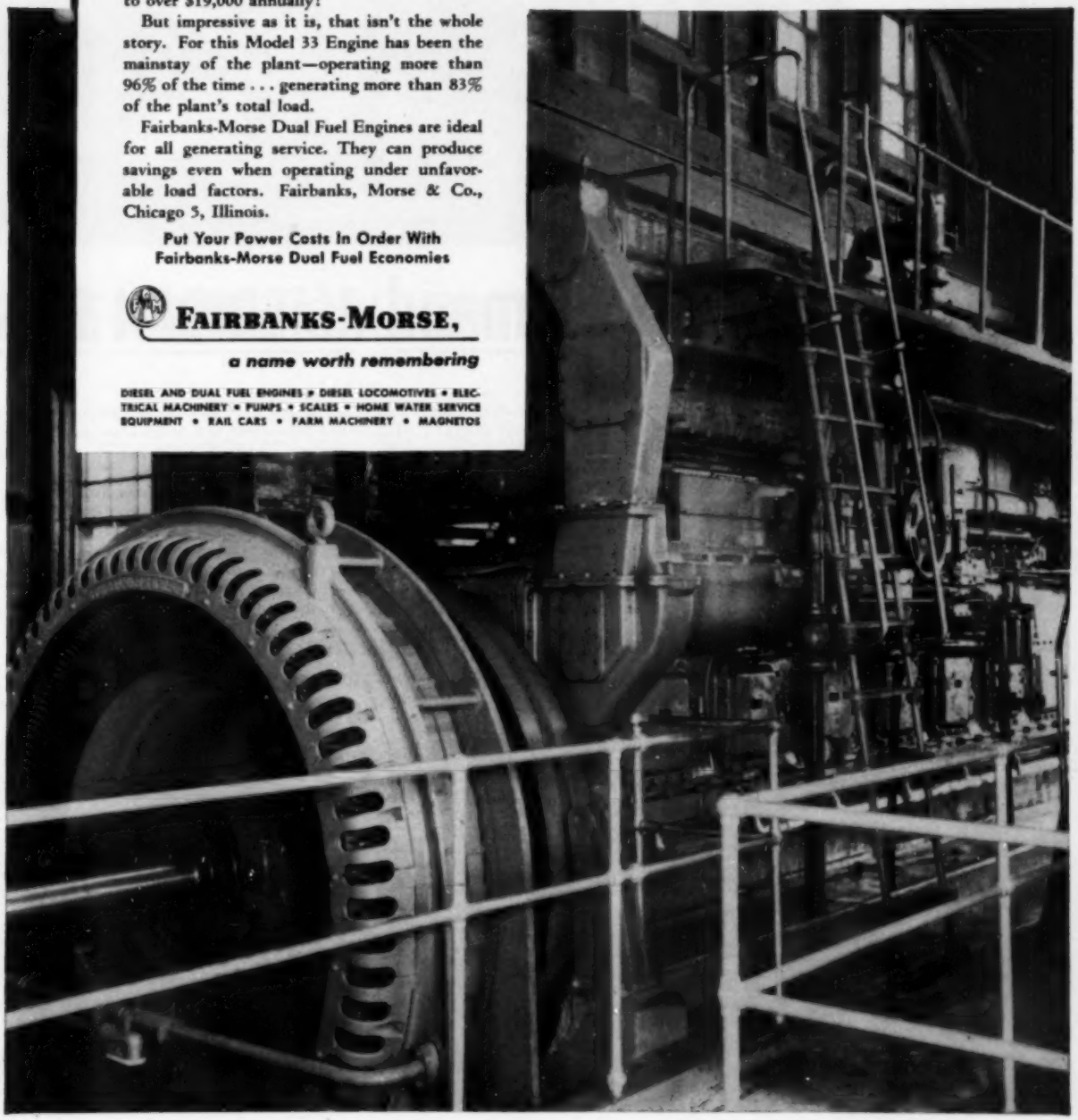
Fairbanks-Morse Dual Fuel Engines are ideal for all generating service. They can produce savings even when operating under unfavorable load factors. Fairbanks, Morse & Co., Chicago 5, Illinois.

**Put Your Power Costs In Order With Fairbanks-Morse Dual Fuel Economies**

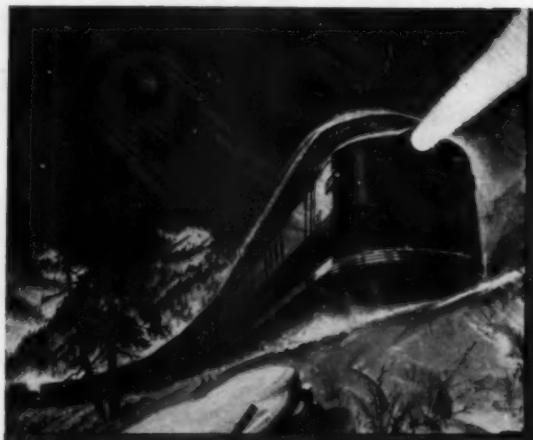
**FAIRBANKS-MORSE,**

***a name worth remembering***

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS



# tough jobs



# demand AMERICAN BOSCH

All over the world, more and more Diesel engines with American Bosch fuel injection equipment are delivering efficient, dependable, economical performance—in trucks and tractors, in locomotives, workboats and stationary power installations.

And world-wide American Bosch service keeps pace. In North America alone, 121 authorized American Bosch stations now serve Diesel users, with new facilities being constantly added to meet new needs.

At these stations, factory-trained mechanics apply the latest and most efficient service methods... work with test equipment and specialized service tools that are designed and built to high factory standards for prompt, accurate, reliable servicing.

Complete precision service like this saves time and money for owners of American Bosch-equipped Diesels ...helps keep their engines working at top efficiency. It's another reason why dependable fuel injection equipment by American Bosch *stays dependable*—everywhere—throughout a long and economical life. American Bosch Corporation, Springfield 7, Massachusetts.

## SERVICE STATIONS IN THE UNITED STATES

**ALABAMA**
Birmingham 3, Birmingham Electric Battery Co., Ave. B & 23rd St. S.

**ARIZONA**
Mesa, Perkins Diesel Service, 747 South Mesa Blvd.
N. Little Rock, Womack Bros. & Taylor, 522 E. Washington.
Phoenix, Charlie C. Jones Battery & Electric Co., 318-322 W. Jefferson St.
Yuma, Yuma Automotive Electric Co., 229 Eighth Street

**CALIFORNIA**
Calexico, Calexico Pump & Magneto Co., 113 East Third St.
Eureka, Industrial Diesel & Electric, 5th & Commercial Sts.
Fresno, Winther Bros., 612 Divisadero St.
Los Angeles, Diesel Injection Equipment Co., 4847 Anaheim Telegraph Rd.
Los Angeles 21, Magneto Sales & Service Co., Inc., 751 Towne Ave.
Sacramento 6, Langner & Rifkin, 1116-22 15th St.
Salinas, Haag Diesel Electric, 37 Abbott St.
San Diego, Magneto Sales & Service Co., 1254 Kettner Boulevard
San Francisco 3, Furrer & Uster, 225 Seventh St.
Wilmington, Diesel Control Corp., 218 N. Marine Ave.

**COLORADO**
Denver 3, Central Supply Company, 1171 Lincoln St.

**CONNECTICUT**
Hartford, W. J. Connell Co. of Hartford, 85 Airport Road

**DISTRICT OF COLUMBIA**
Washington, Diesel & Ignition Service Inc., 925 Girard St., N.E.

**FLORIDA**
Jacksonville, Putlen Sales Co., Inc., 1021 Hogan St.
Jacksonville 1, Spencer Electric, Inc., 40 W. Beaver St.
Miami 36, Florida Diesel Service Co., 1930 N. Miami Ave.
Tampa, Stuart Diesel Service, 3101 4th Ave.

**GEORGIA**
Atlanta 3, Auto Electric & Magneto Co., 477 Spring St. N.W.

**IDAHO**
Boise, Magneto & Diesel Supply Co., 2406 Main St.
Lewiston, Osterman Diesel & Electric Co. 1610 Main St.

**ILLINOIS**
Chicago 16, Illinois Auto Electric Co., 2011-37 So. Indiana Ave.
Peoria, Automotive Ignition Co., 522 Franklin St.
Rock Island, Lahoe Automotive Service, 430 17th St.

**INDIANA**
Indianapolis 4, Gulling Auto Electric Inc., 450 N. Capitol Ave.

**IOWA**
Cedar Rapids, Edwards Carburetor & Electric Co., 209 Seventh St. S.E.
Des Moines, Electrical Service & Sales Co., 1313 Walnut St.

**KANSAS**
Wichita 2, E. S. Cowie Electric Co., 230 S. Topeka Ave.

**KENTUCKY**
Louisville, Schaaf Auto Electric Co., Broadway at Jackson

**LOUISIANA**
New Orleans, Gerhardt's Fuel Injection Service, 734 Girod St.
New Orleans 13, John M. Walton, Inc., 1050 Carondelet St.
Shreveport, Vaughan Tractor & Auto Parts Co., 224 Airport Drive

**MAINE**
Portland 5, Portland Tractor Co., Inc., 803 Forest Ave.

**MARYLAND**
Baltimore 1, Parks and Hull Automotive Corp., 1033 Cathedral St.
Baltimore, Stephen Seth & Co., 876 Park Ave.

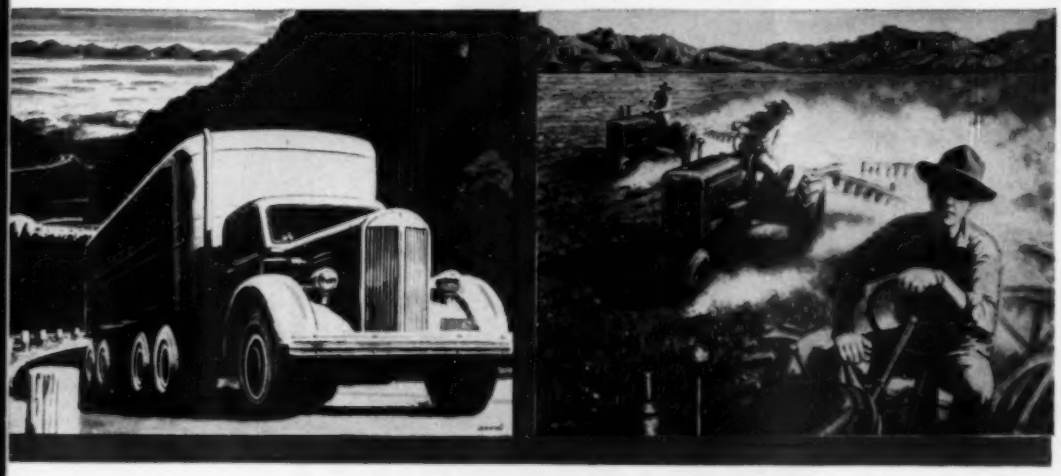
**MASSACHUSETTS**
Boston 15, W. J. Connell Company, 121 Brookline Ave.
Boston 10, Wharf Machine & Electric Co., Inc., Fish Pier Road
Fairhaven, Hathaway Machinery Co., Inc. Hathaway-Braley Wharf

**MICHIGAN**
Detroit, Knorr-Maynard, Inc., 5743 N. Woodward Ave.

**MINNESOTA**
Minneapolis, Diesel Service Co., 2509 E. Lake St.
Minneapolis 2, Reinhard Bros. Co., Inc., 11 South 9th St.

**MISSISSIPPI**
Jackson, Womack Brothers, 1305 South Gallatin St.

# --EVERYWHERE--



# performance and service

**MISSOURI**
Kansas City 8, Electrical & Magneto Service Co., 2538 Grand Ave.
St. Louis 23, Diesel Fuel Injection Service Co., 9331 So. Broadway
St. Louis 3, Electric Parts and Service Co., 2900 Washington Blvd.

**MONTANA**
Billings, Original Equipment, Inc., 423 North Broadway

**NEBRASKA**
Omaha 2, Carl A. Anderson, Inc., 16th & Jones

**NEW JERSEY**
Newark 2, Tire Trading Company, Inc., 239 Halsey St.

**NEW MEXICO**
Albuquerque, Hill Auto Electric Service, 415 W. Marquette Ave.

**NEW YORK**
Brooklyn 9, E. A. Wildermuth, Inc., 1102 Atlantic Ave.
Bolivar, Bolivar Magneto Co., 60 Wellsville St.
Buffalo 8, Hettrich Electric Service, 1032 Ellicott St.
New York 19, American Bosch Corp., New York Service Sales Division, 601 W. 51st St.
Pelham Manor, Coretti-Gross, Inc., 44 Secor Lane
Syracuse 4, F. A. Crossman, Inc., 943 West Genesee St.
Troy, Ehrlich Electric Service, Inc., 200 Fourth St.
Utica, Stiefvater Electric Co., Inc., 320-322 Lafayette St.

**NORTH CAROLINA**
Charlotte, Carolina Rim & Wheel Co., 301 East 8th St.

**NORTH DAKOTA**
Fargo, Northwestern Diesel Equipment Service, 2800 Front St.

**OHIO**
Cincinnati, Tri-State Distributing Corp., Broadway at Eighth
Cleveland 14, The Cleveland Ignition Co., 1301 Superior Ave.
Columbus 15, Columbus Ignition Co., 211 Neilston St.
Lisbon, Diesel Service Co., 234 East Washington St.

**OKLAHOMA**
Fairview, Keck Bros. Diesel Service, 322 S. Main St.
Oklahoma City 2, American Electric-Ignition Co., 124 N.W. 8th St.
Tulsa, Magneto Ignition Company, 701 West 5th St.

**OREGON**
Klamath Falls, Diesel & Electric Service, 1950 So. Sixth St.
Pendleton, Eds Magneto & Diesel Co., S.W. 18th & Court St.
Portland 14, Automotive Products, Inc., 1700 Southeast Grand Ave.
Roseburg, Diesel Products Co., 303 E. 2nd Ave. S.

**PENNSYLVANIA**
Hazleton, Penn Diesel Service Co., 27th & N. Church Sts.
Philadelphia, Sullivan Brothers, 1718 Fairmount Ave.
Pittsburgh 13, Automotive Ignition Co., Inc., 6358-6364 Penn. Ave.

**SOUTH CAROLINA**
Charleston, Diesel Fuel Injection Service, No. 2 Exchange St.

**TENNESSEE**
Amarillo, Radcliff Brothers Electric Co., 501 East Third St.
Knoxville, Diesel-Magneto Service Co., 1209 Island Home Ave.
Memphis 4, Automotive Elec. Service Co., 982 Linden Ave.

**TEXAS**
Dallas 1, Beard & Stone Electric Co., Inc., 3909 Live Oak St.
El Paso, Oakes Battery & Electric Co., 423 Texas St.
Houston 1, Beard & Stone Electric Co., Inc., 805 Polk Ave., P. O. Box 1717
Odessa, Electric Service & Supply, P. O. Box 1471
San Antonio, S. X. Callahan, 425 N. Flores St.
San Antonio, Womack Bros., 1018 S. Presa St.

**UTAH**
Salt Lake City, Diesel Electric Service & Supply Co., 58 East 7th South

**VIRGINIA**
Norfolk, Diesel Injection Sales and Service, 808 Union St.
Richmond, C. H. Woodward Electric Co., Inc., 709 W. Broad St.

**WASHINGTON**
Davenport, Wagner Diesel & Electric, P. O. Box 165
Seattle, Seattle Injector Co., 2706 Second Ave.
Seattle, Sunset Electric Co., 300 Westlake North, P. O. Box 3148
Spokane, Sunset Electric Co., North 703 Division St.
Walla Walla, Industrial Products Co., 610 N. Ninth St.

**WISCONSIN**
Milwaukee 2, Wisconsin Magneto Company, 918 N. Broadway

**ALASKA**
Anchorage, Automotive Diesel Electric Supply & Overhaul, P. O. Box 1160
Anchorage, Bjornstad & Clark, Inc., 445 East 4th St., P. O. Box 1497
Fairbanks, Glenn Carrington & Co., North Turner St.
Juneau, Parsons Electric Company, Second & Seward Sts., P. O. Box 2201

**HAWAIIAN ISLANDS**
Honolulu, Honolulu Iron Works Co., P. O. Box 3140
Honolulu, Todoki Machine & Marine Works, 810 Halekauwila St.

**PUERTO RICO**
San Juan, General Farm Equipment Co., Tras-Miramar, Santurce, P. O. Box 3588

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*"I urge every American employer to promote the Payroll Savings Plan..."*

**DECHARD A. HULCY, PRESIDENT**
Chamber of Commerce of the United States

***"I urge every American employer to promote the Payroll Savings Plan among his employees as a means of building a reservoir of savings."***

As President of the Chamber of Commerce of the United States . . . with literally thousands of contacts throughout industry and commerce . . . Mr. Hulcy is uniquely qualified to evaluate the Payroll Savings Plan.

As a business man, Mr. Hulcy puts his finger on a most important accomplishment of the Payroll Savings Plan: the enormous reservoir of savings, *future purchasing power*, built up by systematic saving.

Today, millions of Americans hold Series E Defense Bonds totaling $34.7 Billion. It will surprise many to learn that this figure is $4.8 Billion greater than on V-J. Day. And the $34.7 Billion total of outstanding Defense Bonds is mounting as more and more employers recognize the importance of the Payroll Savings Plan. During 1951 there was a sizable increase in the number of men and women saving through Payroll Saving Plans where they work.

During the calendar year 1951, 45,500,000 $25 Series E Bonds were purchased — a gain of 17% over the previous year. 12,000,000 $50 E Bonds were purchased in the same period, 14% over the previous year. $25 and $50 denominations are the bonds bought by Payroll Savers.

Building a reservoir of savings and future purchasing power . . . contributing to America's defense effort . . . helping to maintain America's economic stability by providing a check on inflationary tendencies, the Payroll Savings Plan is doing a three-way job.

If your company hasn't a Payroll Plan, or if your employee participation is less than 60%, the Savings Bond Division, U. S. Treasury Department will be glad to help you take your place among America's Honor Roll of "Companies on Payroll Savings". Phone, wire or write to Suite 700, Washington Building, Washington, D. C.

*The U.S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

Rex A. Hadrian

**Editor—DIESEL PROGRESS**

# BUDA DIESELS PROVE THEIR ECONOMY.....IN 203 CONSOLIDATED FREIGHTWAYS UNITS

**Records of fleets like Consolidated show that Buda Diesels run longer with less maintenance at lower cost—proof that Budas are your best power buy today**

**BUDA Diesels Give you These Advantages:**

- **10-15% more torque-lugging ability**
- **13-25% more piston displacement**
- **Average 180,000 to 200,000 miles between overhaul**
- **Less "nick-nack" maintenance**

You can reduce your operating cost . . . keep units going longer . . . speed up your schedules and make more profit per ton-mile by re-powering with Buda dyna-swirl Diesels. Powerful, high torque Buda Diesels are simple in design and heavy duty built to guarantee minimum maintenance and longer operation between overhaul. This means money in your pocket.

**Ask your nearby Buda Distributor about Buda dyna-swirl Diesels for your equipment today. Write for colorful, illustrated Bulletin 1506. The Buda Company, Harvey, Ill.**

***a Power-Full and Dependable Name in Engines***

BUDA

BA-32

**Manufacturers of Material Handling Equipment, Lifting Jacks, Maintenance of Way Products, Earth Drills and Diesel and Gasoline Engines**

# GUN IRON

## . . . THE MODERN METAL for Diesel Engine Wearing Parts

Why is Gun Iron recognized as one of the best materials available for diesel engine wearing parts? The answer lies in physical properties which provide exceptional resistance to frictional wear . . . extreme pressure . . . high heat . . . resistance to corrosion and erosion.

Hunt-Spiller's air furnace process of producing Gun Iron was originated many years ago. However, as a result of constant development, Gun Iron is recognized today as a *modern* metal which can and does contribute to most efficient diesel performance. Its quality is always completely controlled as it is produced in our own furnaces, cast in our modern foundry and, when desired, can be completely machined in our own manufacturing plant.

Gun Iron castings are identified by the letters "HSGI." On your diesel parts they spell long, economical service. Look for them.

### *Since 1810*

*The development of Gun Iron dates back to the founding of this company in 1810. Through the years it became widely known in the production of guns of many types of which this twelve-inch rifle casting of the 1840's is one example. It was because of this emphasis on ordnance products that the term "Gun Iron" was adopted.*

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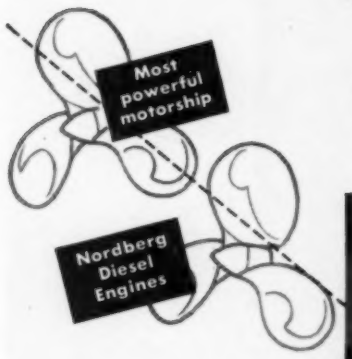
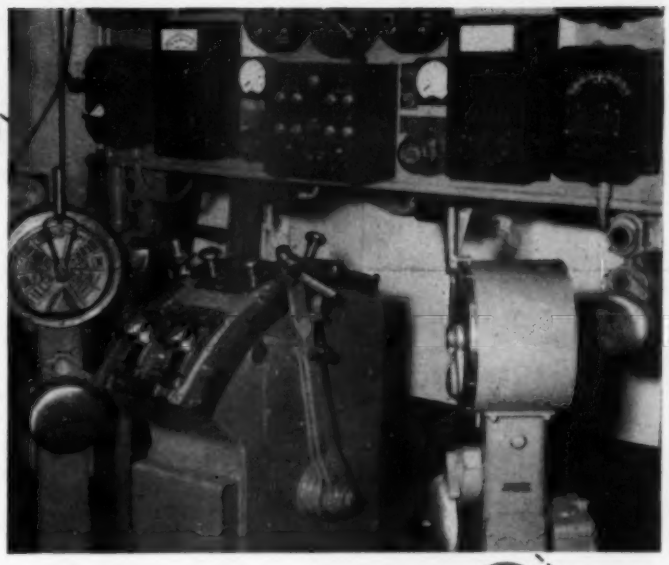
*Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.*

# *Vacationland*




## best in performance . . .



***Vacationland,*** **America's most powerful commercial motorship . . . biggest double-end ferry . . . has been designed for the best in year-round performance.**

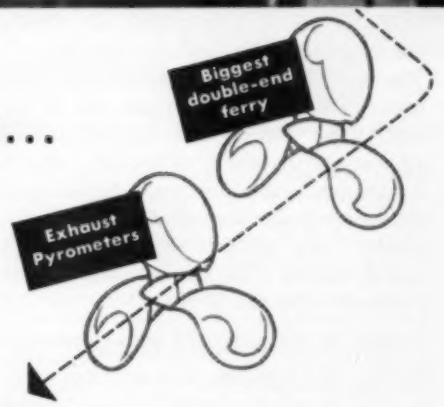
**Four Nordberg diesel engines provide the dependable power that will keep this quadruple screw vessel on a continuous ferry run during the summer season—and give the added plus-power needed for rugged ice-breaking service during the winter.**

**No detail was overlooked in designing *continuous* performance into the *Vacationland*. For example, every cylinder in the power plant has the constant protection of Alnor Exhaust Pyrometers . . . giving advance warning of overloading, pre-ignition, detonation, etc.**

**Such continuous protection is the best in engine protection. A log of cylinder temperatures tells the operator the exact efficiency of the engine . . . tells him when minor adjustments should be made to prevent serious damage.**

**Small or large, your diesel demands the protection afforded by Alnor Exhaust Pyrometers . . . a proved, sure way to lower cost performance uninterrupted by "foreseeable" breakdowns. Write today for *Bulletin 2819* and see how one of the *Alnor line* of marine pyrometers will fill your needs. Illinois Testing Laboratories, Inc., Room 508, 420 N. LaSalle Street, Chicago 10, Illinois.**

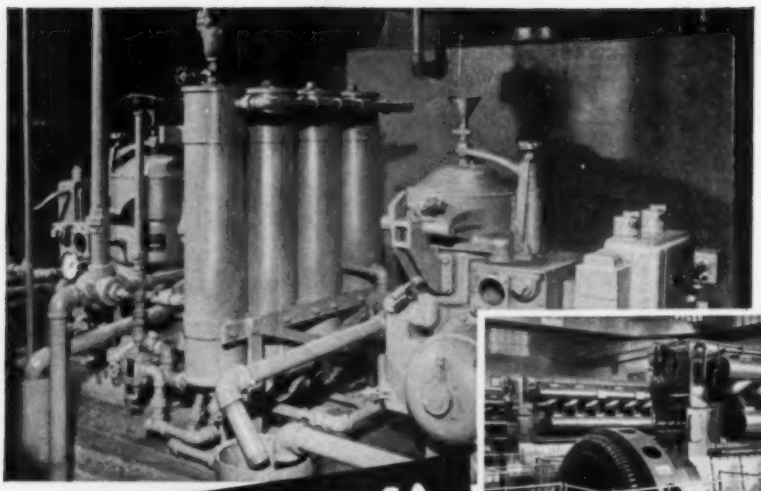
## best in protection . . .

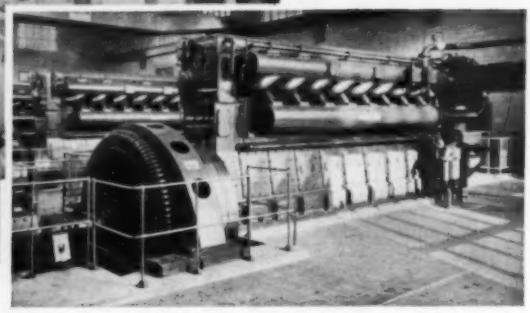



*Alnor*

PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

*man knows only that which he can measure*





AT OWL'S HEAD—

# This De Laval "Puri-Filter" Keeps the Lube Oil CLEAN

To remove all three major contaminants of diesel lubricating oil, Owl's Head uses the De Laval "Puri-Filter." The first two troublemakers — dirt and water — are separated from the oil by centrifugal force. The dirt is stored against the periphery of the bowl where it can not again mix with the oil, and the water is discharged continuously to waste. The third contaminant — colloidal carbon — is filtered out of the purified oil by the filters.

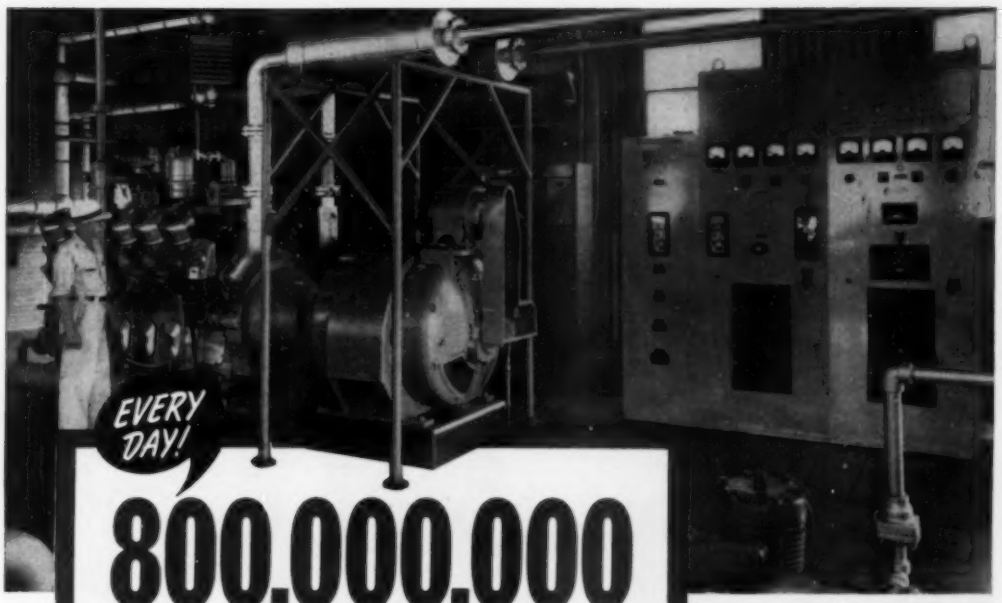
This combination of a De Laval "Uni-Matic" Oil Purifier and a Fram "Filcron" Filter is a completely piped-up unit that is so effective that it gets rid of all solid impurities down to approximately one micron in size. It is by all odds the most effective means ever devised for protecting diesel engine bearings.

Bulletin DL-1 gives additional details. Write for your copy.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

**DE LAVAL** for most dependable power production

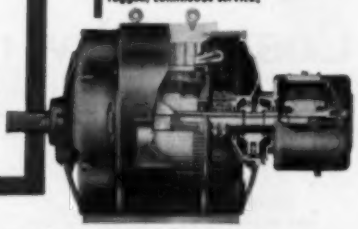
LUBRICATING OIL PURIFIERS



EVERY DAY!

# 800,000,000
## CU. FT. OF GAS
### SAFEGUARDED BY *Standby* POWER UNITS

Below is a cutaway view of an E-M Synchronous Generator. A heavy duty type, it features a direct-connected exciter. Designed for top efficiency in rugged, continuous service.



**E-M Synchronous Generators ready for emergency action at Texas Eastern gas pipe line stations**

With a tremendous daily gas pipe line volume such as this, *protection equipment* can be just as vital as production equipment. Planning ahead to meet any power emergency, Texas Eastern Transmission Corporation has equipped its compressor stations with standby power units.

Essential part of the unit at the Lebanon, Ohio reciprocating station (above) is a 375 kva, 1200 rpm E-M Synchronous Generator.

If high line power should fail at this station, the E-M Generator immediately supplies emergency power to operate the station. When main power is restored, the Generator synchronizes with the central power line and a relay drops off the standby unit. It is ready again for instant service whenever needed.

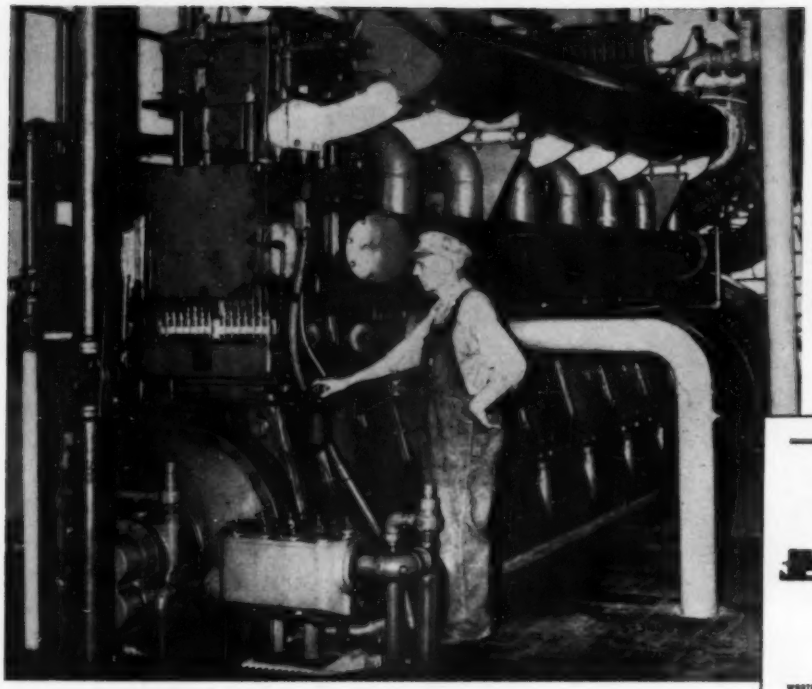
How much is this emergency power worth to you? In most cases, cost of the standby unit is only a fraction of the losses which might be caused by a major system breakdown. E-M's widely-used High-Speed Synchronous Generators, ranging from 1.25 to 5000 kva, are designed and built for consistent, dependable service under a variety of operating conditions.

Call your nearest E-M sales engineer for his recommendation on your requirements. Or write and ask the factory for *E-M Synchronizer* No. 35.

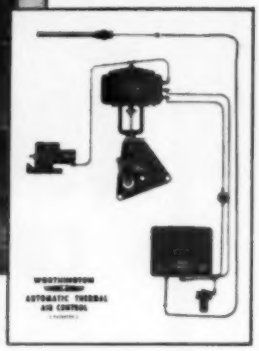
**ELECTRIC MACHINERY MFG. COMPANY**
Minneapolis 13, Minnesota

*Specialists in*
**DEPENDABLE POWER APPARATUS**

2100-TPA-2109



WORTHINGTON 1,000-KW CAPACITY SUPERCHARGED DUAL FUEL DIESEL used in conjunction with municipal steam generating plant at David City, Nebraska.




# Cost-per-kw down over 60% with Worthington Dual Fuel Engine

David City, Nebraska—this city has proof that the Worthington Dual Fuel Diesel can reduce power-plant operating costs.

Engineering of this installation—made in August, 1949—was under the direction of Black and Veatch, Kansas City, Mo., Consulting Engineers. At the present time the unit operates at only one-third capacity in supplementing steam power generation.

In spite of these poor load conditions, the David City plant's overall operating cost per kw was down 60% the first year this engine was used.

**ONE BIG REASON YOU GET MORE EFFICIENCY FROM THIS ENGINE**

Worthington's Automatic Thermal Air Control—an exclusive patented Worthington feature—is one of the biggest reasons you get more efficiency from this dual fuel engine—or from Worthington gas engines.

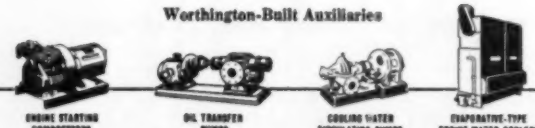
Unlike any air throttling mechanism dependent on governor action, this unit is actuated by engine exhaust temperature.

It maintains optimum air-fuel ratio at all times; provides automatic variation of air quantity in direct relation to ambient air temperatures; automatically compensates for changes in the heating values of the gas fuel (this would require manual adjustment where air-throttle controlled governor is used); maintains highest fuel economy at all loads regardless of changes in air temperature or fuel quality.

Worthington engines can increase *your* plant's efficiency and lower operating costs. For more facts on Dual Fuel or other engines, gas or Diesel, write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

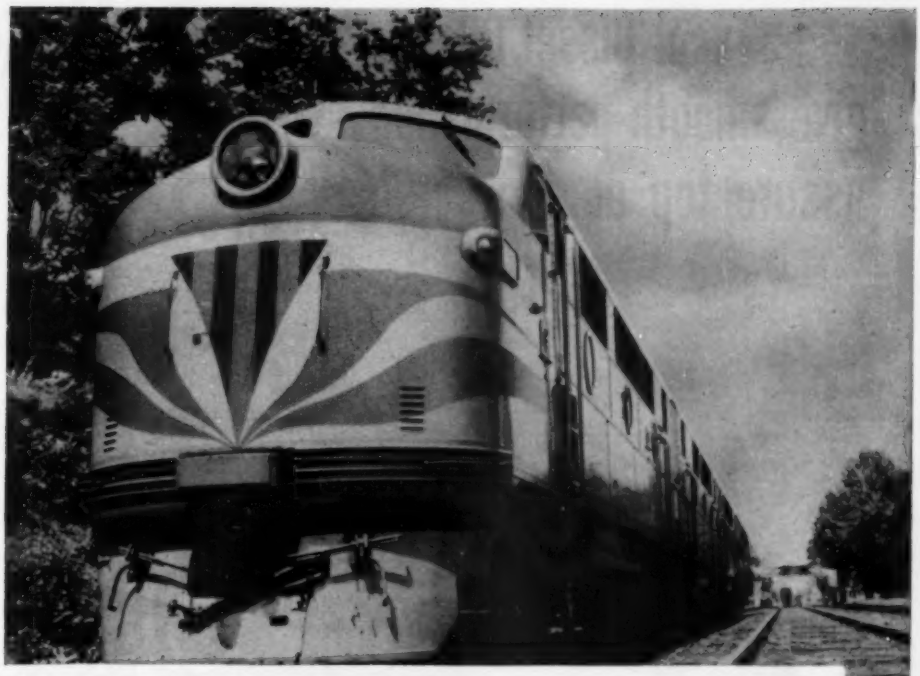
E1.13

**Worthington-Built Auxiliaries**




**Economical Continuous Power**—Diesel Engines, 150 to 2,640 hp . . . Gas Engines, 190 to 2,880 hp . . . Dual Fuel Engines, 150 to 2,640 hp.

**WORTHINGTON**
Engines



# NOW – even better protection against deposits and ring sticking

## the new, improved Gulf Dieselmotive Oil

Now—because of greatly improved detergent-dispersant characteristics, Gulf Dieselmotive Oil provides even better protection against harmful deposits in railway, marine, and stationary Diesels. It's ideal for engines with high power ratings and for use with fuels containing cracked materials or sulphur — keeps oil control and compression rings cleaner and freer. As a result, wear and oil consumption are kept remarkably low.

In all other respects, Gulf Dieselmotive Oil retains the same superiority demonstrated in millions of miles and thousands of hours of service. Made from 100% solvent-refined oil, it does not form harmful metal-like deposits on piston crowns, especially important where the same oil is in service for a long period of time.

Containing an excellent oxidation inhibitor, Gulf Dieselmotive Oil has outstanding resistance to oxidation and the formation of crankcase sludge. And it's nonfoaming and noncorrosive to silver bearings.

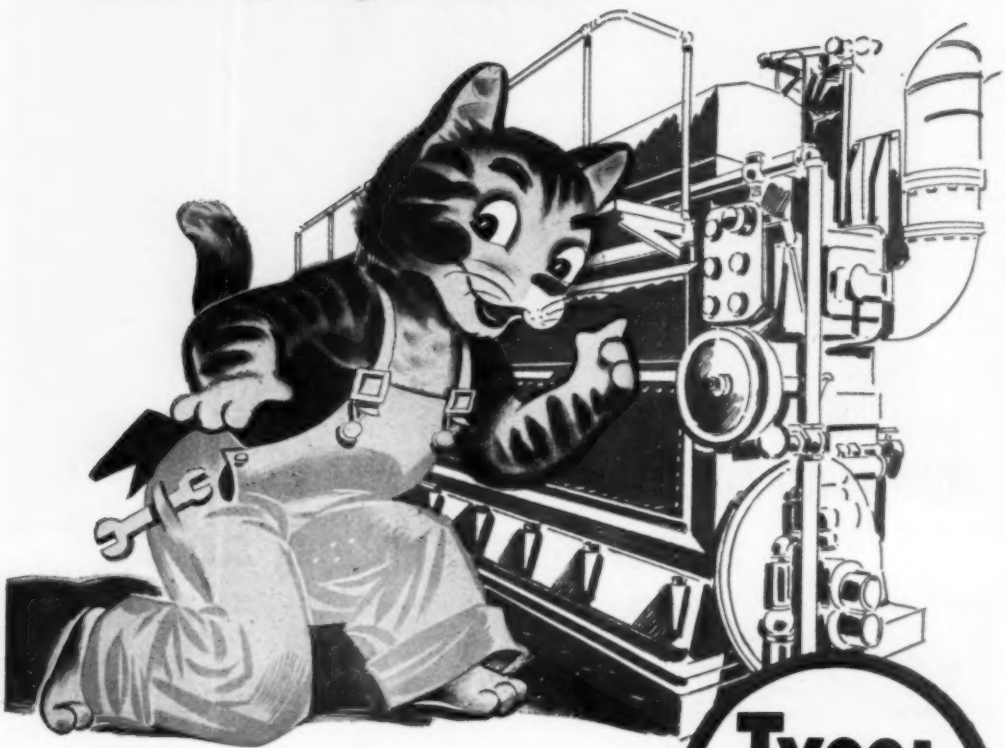
These advantages add up to cleaner engines, reduced cylinder wear, and lower maintenance costs.

For further information, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company
Pittsburgh 30, Pennsylvania

GULF

# "Tycol Diesel Oils give smooth performance... assure top engine service"



Absolutely correct! Tycol Diesel Oils are a must for satisfactory lubrication. Their degree of refinement – their service endurance – and their high stability mark them outstanding.

Tycol Diesel Oils have more than proved themselves after years of operation in Diesels of every description and in all types of service... from high-speed units for industrial, railway and marine uses where a heavy-duty or detergent oil is necessary to low-speed Diesels where a non-additive lubricant can be used. Yes, sir, there is a Tycol Diesel Oil scientifically engineered for every Diesel application – engineered to do the job better... at lower cost.

Your nearby Tide Water Associated office will be glad to give you complete information. Wire or phone today.

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# It's TOPS... so it's MARLEY!

## GEAREDUCERS

**designed specifically for cooling tower fans**

Geareducers are designed and built by Marley to do just one job—drive fans up to 264 inches in diameter—and do it better than any other mechanism. Years of research and field service prove Geareducer design provides everything needed to resist thrust set up by huge fans. This includes oversize taper roller bearings; hardened alloy steel gears of scientifically selected ratio; pumpless, continuous splash lubrication, super-strong shafts and cases. Every detail of the design has a specific purpose: consider the wide-spread feet for great stability and the magnetic drain plug that retains any loose particles of metal that might cause wear.

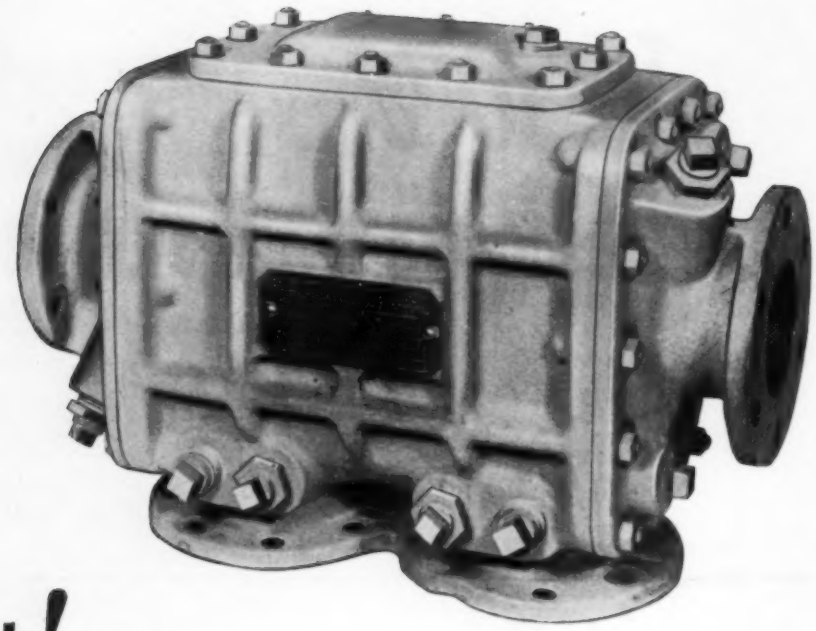
In production all machine processes are constantly inspected with exacting care. When completed, every Geareducer is run in, disassembled, carefully checked part by part, completely coated with moisture resistant grease, and reassembled for shipment.

producers of
DOUBLE FLOW TOWERS
DRICOOLERS
AQUATOWERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES
VAIRFLO TOWERS
DOUBLE FLOW AQUATOWER

MARLEY

**The Marley Company, Inc.**

Kansas City 5, Missouri



# Efficient! Compact! Durable!

Diesel engine manufacturers have learned that they can depend on Harrison heat exchangers—oil coolers, water coolers—to do specific cooling jobs *right.* These men know that Harrison coolers combine high capacity with compactness—a combination that means much to designers and engineers.

Our years of designing and manufacturing heat transfer products of all types qualify us to be of service to you.

We welcome the opportunity to discuss your heat transfer requirements with you at any time.

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**HARRISON RADIATOR DIVISION**
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**LOCKPORT, NEW YORK**

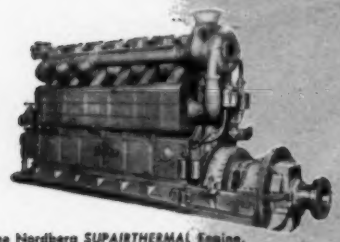
FOR THE BEST SOLUTION TO YOUR POWER PROBLEMS...

# LOOK TO NORDBERG

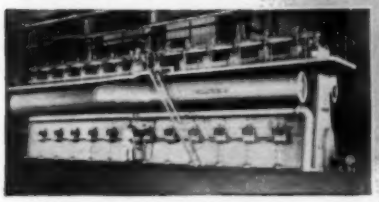
—builders of America's largest line of

**HEAVY DUTY DIESEL ENGINES—**

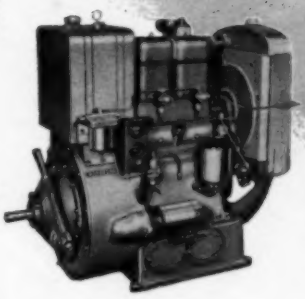
**10 TO 10,000 HORSEPOWER**



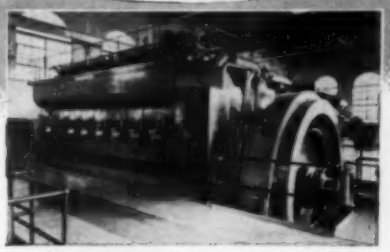
The Nordberg *SUPAIRTHERMAL* Engine, the latest development in the Diesel field, is available in a complete range of 4-cycle types for all applications, in sizes from 425 to 3200 H.P.—including Diesel, Duafuel, or spark fired gas operation.



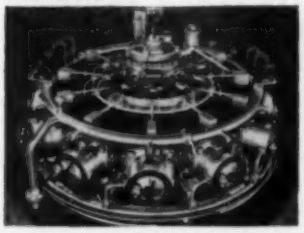
Nordberg 2-cycle Diesels for marine or stationary service are built in a wide range of types and sizes, from 880 to 10,000 H.P.



Nordberg "Packaged" Diesel Power Units—from 10 to 45 H.P., 9 to 30 K.W., for generating electricity, pumping, and straight power applications.



Nordberg 2-cycle Duafuel engines are built in a wide range of sizes from 880 H.P. upward—all of which burn oil, gas, or any combination of both — and are instantaneously convertible from one fuel to another, under full load.



Nordberg 2-cycle Radial engines develop 2125 H.P. or 1500 K.W. at 400 R.P.M. Available as an oil burning Diesel, as a natural gas engine, and as a Duafuel engine.

IN the complete line of Nordberg two and four-cycle oil burning and Duafuel Diesels and gas burning engines, you will find the right size and type of unit to meet your power requirements.

From the smallest to the largest engine, every Nordberg unit is built to deliver low-cost, dependable power . . . and the basic dependability of Nordberg engines has been amply proved in service on hundreds of successful stationary and marine power applications all over the world.

If you're planning on adding to your present power capacity, or providing new power facilities, it will pay you to investigate the long life and dependable service you get with Nordberg Engines. Write for further details, outlining your power requirements.

**NORDBERG MFG. CO., Milwaukee, Wisconsin**

P-SHM152

BUSCH-SULZER
A DIVISION OF NORDBERG

**NORDBERG**
**DIESEL ENGINES**

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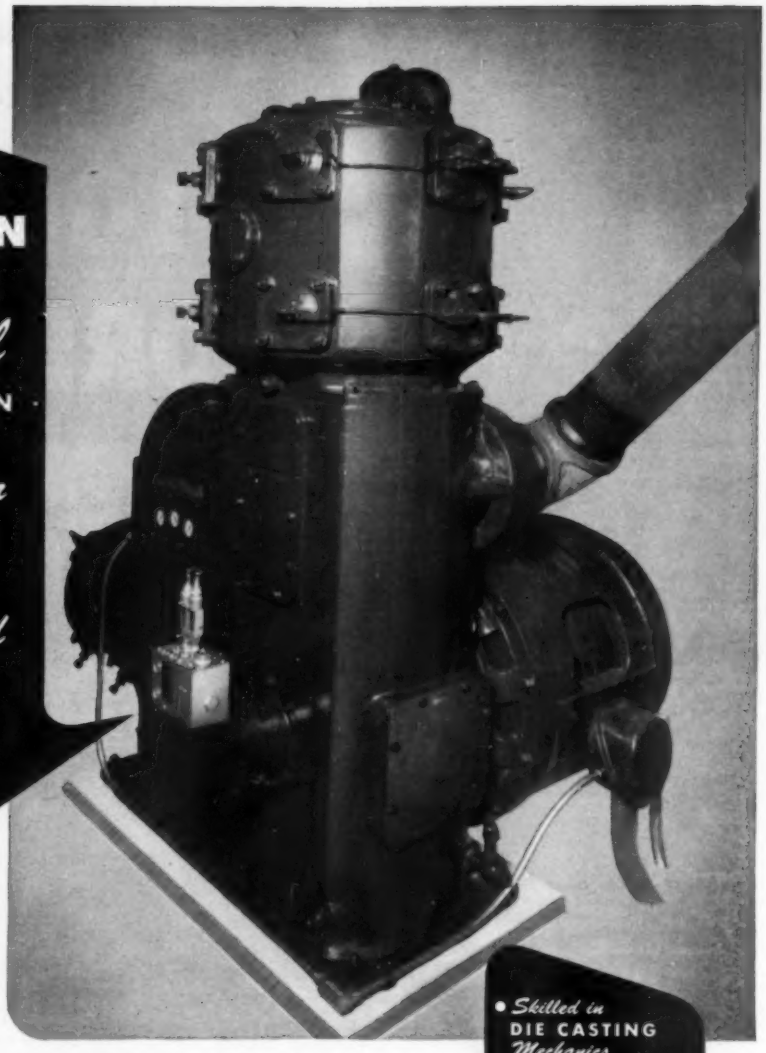
*fed under pressure by the measured drop!*



*Illustrated, the Madison-Kipp Model SVH Lubricator on an Ingersoll-Rand XLE Compressor.*

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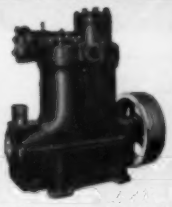

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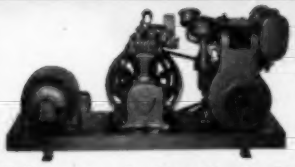

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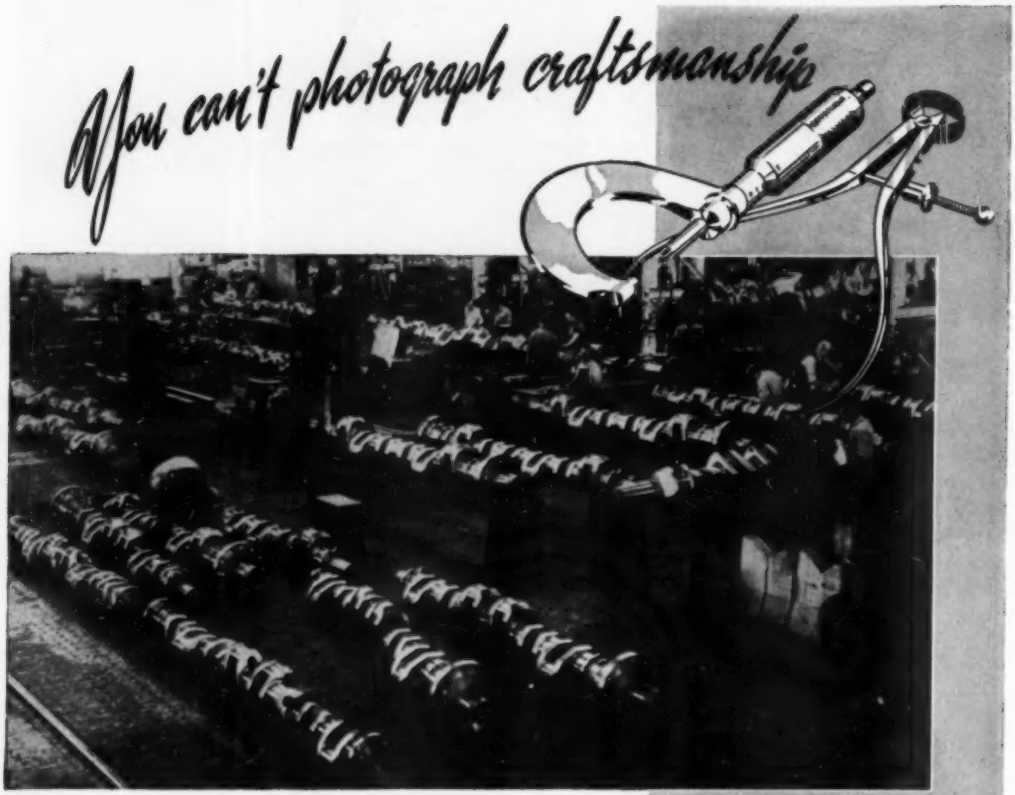

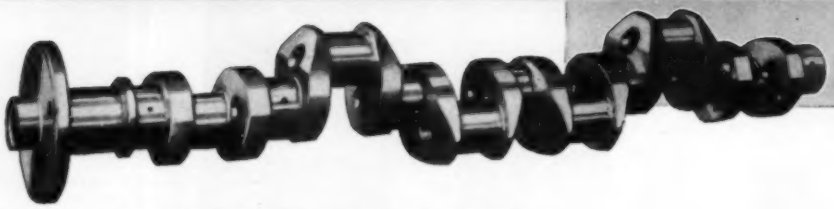

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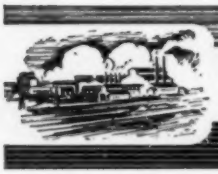

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# Charles Edward Johnson

1875 • 1952

CHARLES E. JOHNSON was born on a farm near Newaygo, Michigan, in 1875. He became, in turn, a woodworker, a cabinet maker, a laborer in a bicycle factory. He designed camshafts for Muskegon Motor Specialties and became tool room foreman for Continental Motors.

In 1911, with Paul R. Beardsley, he founded the Piston Ring Company, which later became the Sealed Power Corporation. They produced their first piston rings at night and during weekends, while holding other jobs. The quality of the rings soon brought orders that required full-time operation. The two partners then went on the payroll at 30 cents an hour each.

Mr. Johnson's inventive genius resulted in better and better piston rings. Ultimately he held dozens of patents and his insatiable interest in things mechanical persisted to the instant of his death which took place as he was working on the engine of his automobile.

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DIESEL GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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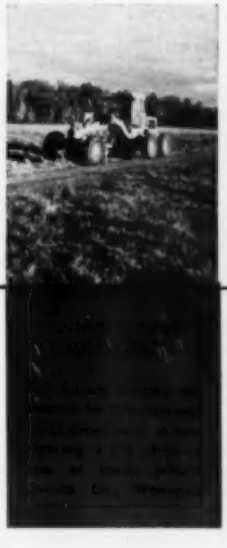

*Drawn above is a magnified view of two drops of Diesel lubricating oil taken from two new Diesel engines.*

# Which is the better diesel oil?

Chances are, you'd pick the clear clean oil on the right as the better oil . . . but you'd be wrong.

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# UNION OIL'S NEW LABS. BETTER THINGS FOR DIESELS

*By* JAMES JOSEPH

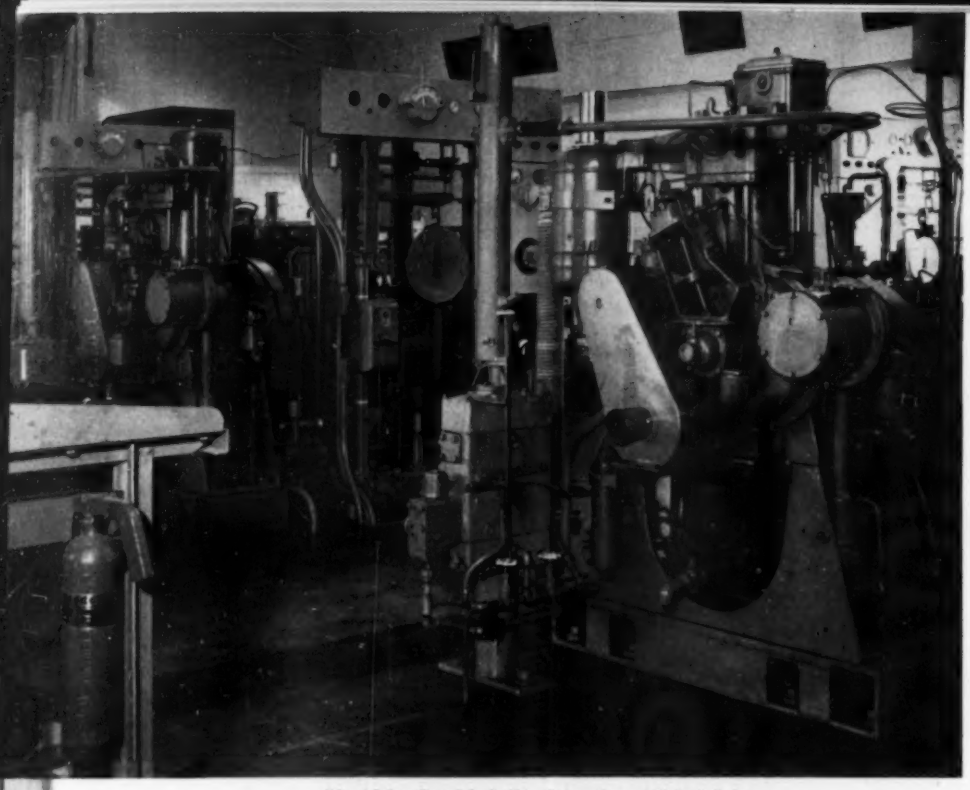
**Entrance, Union's new Research Center.**

THE U.S.'s most modern—though not the largest—petroleum research laboratories have risen in the rolling hills of Orange County, near Brea, Calif. They're Union Oil Co.'s $8,000,000, 232,000 sq. ft. Brea Research Center—incorporating a dozen lube oil and fuel oil innovations, and promising better things for diesels.

The 14 single-storied center that spreads over a 22-acre site contains three petroleum-chemistry laboratory structures, administration building, uniquely designed six-celled high pressure test lab, engine and analytical laboratories, unit process building, cafeteria, and a technical library. Of interest to diesel and gasoline engine engineers is the engine lab, where lube oils and fuels are daily being tested, and from where murmurings come of a newly developed diesel fuel. Just what this new fuel is, Union isn't saying at present. Research supervisor for the engine lab is C. C. Moore.

Four single-cylinder Caterpillar test engines are putting diesel lube oil and fuel oil under qualification tests. They're instrumental in developing new compounded, heavy-duty oils. They're also being used for the study of special fuels, for marine engines, and especially for use by the U. S. Navy. These test engines, actually standard tools of petroleum research, use new liners and pistons for each test, and run for about 480 hours during a typical development study. Dynamometers load the test engines, loading engines for 20 hp.

Also installed in Union's new engine labs are special super-charged single-cylinder test engines, which run for the identical 480-hour test, but with



Diesel lube oil and fuel oil testing engines at Union's Lab.

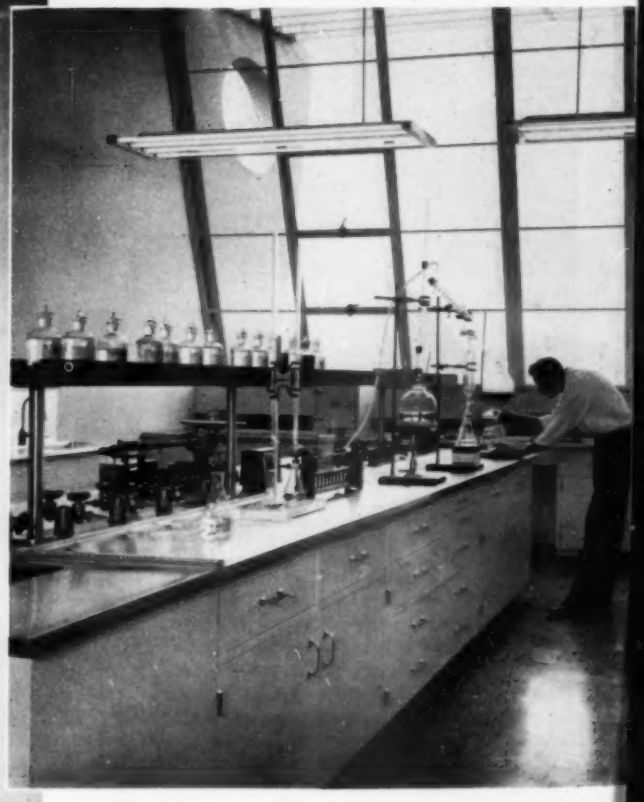
average, typical horsepower loadings to 30 instead of 20 hp. Single cylinder test engines are also used, diesel-wise, to determine the cetane rating of diesel fuels. These particular cetane determining test engines are CFR models (Cooperative Fuel Research Group). They're concerned with fuel cetane ratings only.

Union's engine lab also has 10 Lauson test engines, for research on lube oil for gasoline engines. These, as Research Supervisor C. C. Moore explains, are a kind of "coarse" screening engine in the study of lube oils. "If oils look good after test runs in these engines, then they're tried on our other, final test rigs." The 10 Lausons runs at cooling water temperatures as high as 300-340 degrees F., with oil temperatures as hot as 260 degrees F. The same bank of 10 engines are put to use in deposit study work.

The lab also houses four CFR octane-determining test engines. These are being used in developing special aviation gasolines. Three of the CFRs used for gasoline development are supercharged, used for aircraft fuel research. Another bank of Chevrolet test engines is used for routine fuel and lube oil studies. C. C. Moore estimates that fully 50 per cent of the lab's work is with diesel fuels, and like most petroleum researchers, likes to keep his current studies to himself. "That's the way it is with the competitive research game," he says.

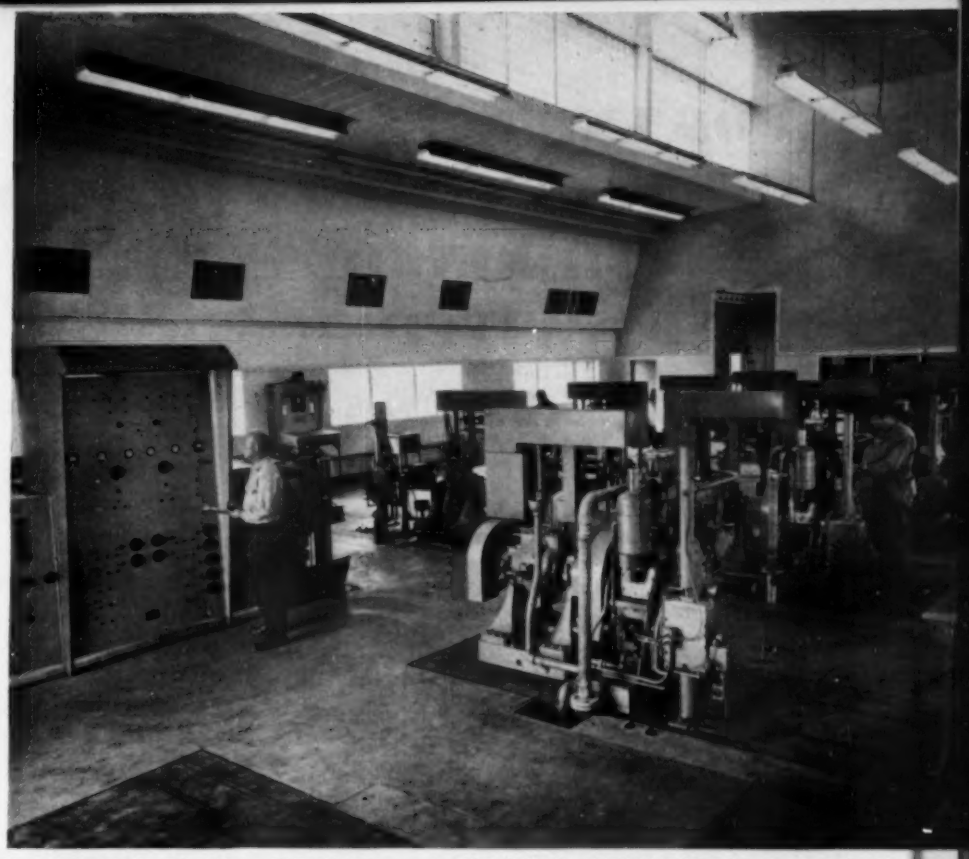
Central control board for diesel research labs.

In labs like these new diesel fuels are being developed.

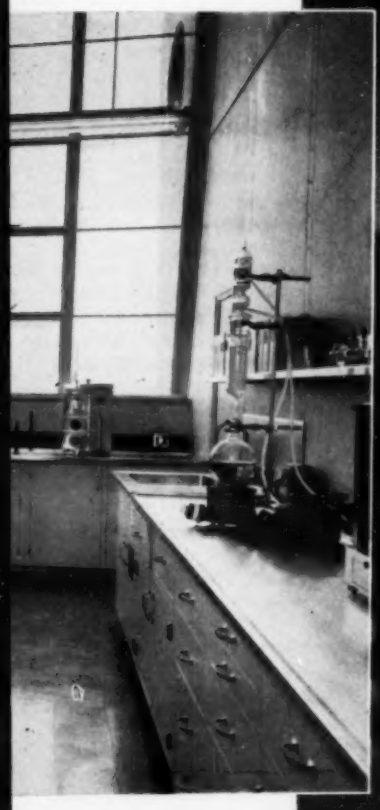


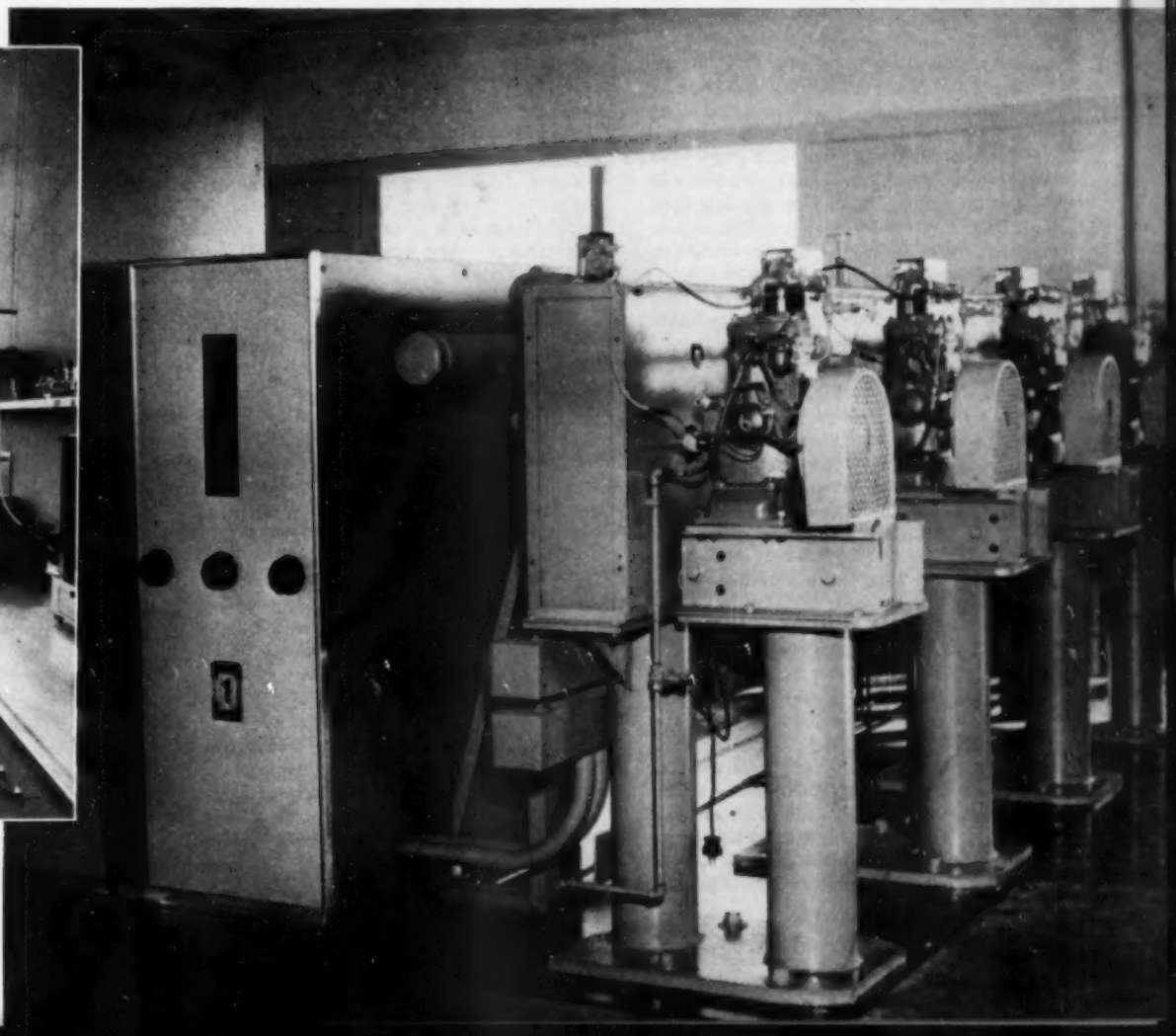
Union is currently at work on some special fuel and injector tests for the Navy, and the lab uses a 4-cylinder GM-71 for the work. This engine, a test set-up like the others, uses a wide variety of injectors—from the ordinary commercial types to special, newly devised overload sizes for specialized Navy applications. Preventive maintenance is built into Union's new Research Center—as in no other laboratory of its kind in the U. S. Hundreds of pipes and miles of piping that feed labs, control centers and the like, run beneath the buildings in truck-width, 9-ft. high, 11-ft. wide utility corridors. There are some 1855 linear feet of heavily reinforced concrete tunneling beneath labs—including the engine lab building. All piping is exposed, suspended from ceiling brackets. Instead of trenching and tearing out walls when a leak occurs, all maintenance men need do is drive a pickup or flat bed truck down one of two access ramps. Workmen make repairs right from the truck bed —without scaffolding or ladders. No other U. S. lab is designed with this built-in maintenance tunnel—geared to keep up the Center's high degree of efficiency.

Meanwhile, in three laboratory buildings, research goes on. These test tube experiments, when coordinated with actual running tests in the engine lab, point to better things for diesels. Which is one reason for Union's $8,000,000 expenditure in research facilities.



These test engines determined fuel and lube oil ratings.





Diesel lube oil and fuel oil testing engines in new engine lab.

# SPOKANE INTERNATIONAL RUNS ITS ENTIRE RAILROAD WITH NINE 1000 HP. ROAD SWITCHER DIESELS

*By* CHARLES F. A. MANN

UP in the Spokane Country, since 1941, people and industries have been taking increasing pride in Spokane's own little railroad company that plays such a vital part in the expanding economics of the inland heart of the Pacific Northwest.

Since 1941, when the Spokane International Railroad emerged from a nasty old Section 77-B receivership started in 1938, it has marched rapidly ahead as a totally independent little system having 151.97 miles of perhaps the most vital "Connecting Link" trackage in the whole west. Prior to 1938, the S.I. was a dismal, beat-up little appendage on the Canadian Pacific-Soo Line mess typical of the U.S. parts of all Canadian Systems—left alone to rot on the vine and crawl along with rough, lightweight track, castoff motive power and a past, now forgotten, consisting of ambitious plans on the part of Canadian-American railway promoters to cross-connect Canada and the U.S. by joint ventures between the two countries—most of which failed to materialize as both nations began to close their borders by the invisible flow of commerce, tariffs, money and politics.

Spokane International had its inception in the days when James J. Hill punctured every North-South Gateway across the U.S.-Canada border from the Great Lakes to Puget Sound by branches of his Great Northern. Most of them were pushed north to tap timber and mineral traffic, as well as to block the Canadian Pacific, Canadian Northern, Grand Trunk and other Turn-of-the-Century Canadian Systems from tapping south into the northern fringe of the U.S. potential rail traffic. So, in 1905, the booming Spokane-North Idaho panhandle country found itself completely monopolized by the Great Northern. Jim Hill fought every attempt by Union Pacific, the Milwaukee and private shippers to get a competitive link between the Canadian Pacific's Crows Nest Pass alternate Transcontinental (South) line across Canada, and down into the Spokane country. The Spokane International came into being as a sort of "Open Door" connecting line between the rivals of Jim Hill and the CPR. As traffic patterns changed, the once blossoming Chicago, Spokane-Portland passenger Limited via the Soo, CPR, S.I. and Union Pacific, disappeared, and the little Connecting Link Railroad folded and withered like grass in the pastures in August. Its fleet of antique little teakettles, its dismal shops and rusty, 75 lb. rail could not support its independence any longer, so it went broke in a period when highway travel to the north out of Spokane folded up railroad passenger, mail and express travel on not only the S.I., but on the Milwaukee and Great Northern branches as well. And, soon followed the clamp-down on Canadians spending travel-money in the U.S.A. It looked like curtains for the Spokane International.

However, in the stretch of track from Bonners Ferry, Idaho to the Canadian border, lay a 30-mile stretch of track that was railroad dynamite. All the rest of the 120 miles of Spokane International was merely high iron hash. Its Spokane industrial tracks could easily be parcelled out to the existing four Transcontinental Systems. The main line up to Sand Point could well be given to the Northern Pacific as it parallelled it most of the way. The line between Sand Point and Bonners Ferry could be torn up. At Bonners Ferry the Great Northern's transcontinental line could do all the work, but, from Bonners Ferry to the border was the key to the future. Turn this loose and Gone With The Wind the competitive gateway for Spokane and the Union Pacific. Back East, the combination of howls from the Milwaukee, the Union Pacific and the insurance companies holding the bonds on the defunct S.I. could be heard in Wall St.

So, a deft piece of financial surgery, and the new S.I. was born April 1 as a new Washington Corporation, back there in 1941—almost on the day the rumblings of World War II began. Useless trackage at Spokane became the monopoly switching tracks for huge military plants located there. A back door branch led to the giant Kaiser Aluminum empire, outside of Spokane. Overflow from Canadian routed westbound shipments poured traffic into the top in interchange with Union Pacific. The hungry Consolidated Mining & Smelting Co. furnaces at Trail demanded phosphate rock from Eastern Montana, so the Milwaukee began feeding new tonnage from the East. Overnight the new management under F. C. Rummel as president, found gold where red ink was before. Gross revenues have been remarkably steady ever since, and showing a rising curve of about 5% per year, as the Spokane Inland Empire rises industrially, from its one-time sole dependence on mining and agriculture and in some outlying areas, forest products. Gross revenues in 1950 rose to about $2,300,000 and up about 10% in 1951, despite a sharp drop from a peak of $96,000 in passenger revenues in 1943 to a mere $12,500 in 1950. Mail revenues show a steady gain, as the great B.C.-Alberta boom grows with the Spokane Country boom, and switching revenues, now double that of 1941, pass $100,000 yearly.

With long-range revenue curves looking like the S.I. will be as nearly 100% dependent on freight traffic for its bread and butter as any U.S. railroad, large or small, with consequent little bother about unprofitable passenger mileage to drag down operating ratios; the grim facts of keeping expenses down and rates as high as the lag-behind rate structure will permit, the big operating fact of life for S.I. will be to keep operating costs as low as possible. In 1949 the operating ratio on the

**Typical 2400-ton freight on Spokane International Viaduct above Bonners Ferry, Idaho. Two 1000 hp. Alco's.**

S.I. reached the positive, alarming danger point. From the high sixties, back in 1941, after a general wage and material rise, the operating ratio climbed steadily to 87.25%—about 3% below the funeral-stage for most railroads that have to pay interest on debt. Beyond that the lawyers are called in and the day in court set! So, the Directors decided to abandon steam entirely and dieselize the entire system.

Fortunately, by 1949, the road switcher diesel became a profitable, reliable fixture in railroad motive power. Nine 1000 hp. Alco diesels were ordered, two with 1600 lb. heating boilers to use on the two passenger trains, and the other seven for road switching duties over the entire line. The Spokane roundhouse was converted to a diesel shop and the old teakettles sold as scrap. The abrupt changeover to 100% diesel operation resulted in the astounding drop from 87.25% operating ratio to 64.06% in one year! Nine diesels did the work of a fleet of 14 aged steamers, and cut costs 23%. Transportation expenses dropped actually 24%. Fuel costs were only 36.7% of the 1949 cost! Locomotive miles decreased 11¼% while the loaded car-miles increased 9%.

The comparatively short mileages on S.I. give rise to a rather unique locomotive operation. All diesel units are of the same size and make, and have the same gear ratio, and all trains are practically operated as road switchers. Even the passenger trains regularly carry a caboose at the end, and southbound, from the CPR at Yahk, B.C., it is not uncommon to see a carload or two of fat cattle from the Canadian prairies racing along to market at Spokane, or northbound, a carload of produce or bananas riding the night train north to Calgary and Edmonton markets. This putting of "hot" freight cars on the passenger train saves 24 hours in Spokane and Canadian markets. The shippers like it and so do their customers, and it is twice as fast as trucks. This business of operating a railroad in an uninhibited fashion gives substance to the point that why shouldn't freight and passengers ride the first train out and why shouldn't every train on the line run as fast as it can? Why have a 24 hour train for one commodity and a 6 hour train for another on the same run?

The territory west of Sand Point, Idaho generally makes it feasible to run freights with a single Alco diesel. North (east in railroadese) of Sand Point, sometimes two Alcos are hooked on to a freight train. Uphill, out of Bonners Ferry, where the line runs up the Moyie River to the Canadian border, generally averaging 1% grade all the way, two diesels always are hooked to the freight trains. Stringing out diesels in two small, lightweight units, makes it safe to run over the light stretches of 72 lb. rail and light trestles, most of which has been in place since 1906! Where else can one find an important piece of railroad still able to navigate with 72 lb rail 46 years old! The diesel changeover saved Spokane International the immediate need of spending $1,000,000 on long stretches of new 90 lb. steel and heavier bridges, by simply an automatic reduction in axle loads the instant steam gave way to diesel.

Eventually, the operating department hopes to get 1500 hp. road switchers in place of their 1,000 hp. diesel units, as the entire system is rebuilt with 90 lb. steel. But the character of the freight hauls done by the S.I. will never call for excessive high speeds and heavy power, as well as the relatively short hauls and general profile of the line. Meanwhile the fantastically old and outmoded steam locomotives, all bought in either 1907 or the 1910-1912 period, went out the window in 1949, and within a few weeks after the order for Alco diesels —$1,100,000 worth—was placed in April 1949, the 139 miles of main line from Spokane to Eastport, Idaho, and the Coeur D'Alene Branch bristled with the shrill diesel horn. A swift change in the manpower and public responsiveness followed. Younger men took over with diesel and stopped wandering to other rail systems or other jobs. The whole morale of the S.I. organization snapped to attention. So did the statistics!

It was now fun to undertake rebuilding the entire railroad, as younger men began taking pride in their work. The grimy old roundhouse blossomed out with washed windows, fresh paint and a beehive of interesting speculation. The yard crews and train crews use the diesel roundhouse as a sort of Club! A small railroad is like a cozy family, and it was diesel that brought the boys and girls together. The old general offices across the river in downtown Spokane likewise awoke with a pleasant start. No longer was the outlook drab and stuffy. They all suggest that visitors go out to the shops and see the new layout and fancy three-color paint jobs on locomotives, passenger cars, freight cars and cabooses.

The 139 mile Mainline is gradually being replaced with 90 lb. rail—4 or 5 miles each year, the fast stretches first and the hilly slow country last, where wear is not excessive. The 28 bridges and 7,200 feet of trestle are all being rebuilt and the three short tunnels relined as needed. Gradually, the entire roster of equipment and all roadbed will be rebuilt and modernized out of income. The dieselization investment is one of the greatest investments ever made in the Line's history, for not only does it cut operating costs 25% but it delays for perhaps years, the pressing necessity of rebuilding the entire line to heavier standards if modern steam power were to be immediately substituted for the old lightweight, uneconomical steamers. Almost identical to the problems faced by the Gulf Mobile & Ohio in 1947-48 when they kept their long lines

of 90 lb. steel mainline, and substituted 100% light-axle easy riding diesels for the fleet of track-busting old steamers. So does the S.I. now keep, and safely so, much of its 72 lb. rail and keep going with diesels. The *secondary benefits of diesel* on both the S.I. and G.M.&O. are among the largest and most outstanding by way of example than any two systems in the entire U.S.A.! The million dollar Alco order for S.I. was worth an additional $4,000,000 in roadbed expenditure.

LET'S TAKE A RIDE—Hardly a more compact, cozier railroad family is to be found than on the Spokane International. So let's get acquainted. The dispatcher efficiently rouses us at the hotel downtown at 4 a.m. for the early morning freight run to Kingsgate-Eastport (one of the two towns is in Idaho and the other in B.C.) and the short run on the CPR to Yahk, B.C., the CPR junction point. Chief Engineer J. B. Williams is the "Know-All" man of the Railroad! He worries about the roadbed as well as the motive power—a sort of hybrid job as Division Engineer. After introductions and a wait till 6:19 a.m. we are off with a main train consisting of twin Alco 1000 hp. diesels ahead of 9 loads and 20 empties, with Mr. Antone Scioly, as engineer and young Harvey Hotary as fireman. The entire run is a switching and road haul operation with two main terminals between Spokane and Eastport. Bonners Ferry and Sand Point are important points and big interchange points with the G.N. and N.P.

An uphill grind to Velox where we pick up 8 outfit cars bound for a work program on the top of the Moyie River Hill. At Grand Junction we pick up 11 cars of phosphate rock bound for Trail Smelter, from the Milwaukee Railroad, then off at 25 to 30 mph. for Dover, where we pick up 2 loads of lumber and set out 2 empties, making our 49 car freight train a rather impressive sight as we start down the slight grade toward Lake Pend Orielle, finally reaching Sand Point at 10:40 a.m. where a long switching period and noon eating stop is made. At Sand Point we deliver 2 cars to the Northern Pacific and pick up 13 more cars of phosphate off the Northern Pacific. Then more delays for a worktrain and 2 empty boxcars dropped off at a sawmill and a stop to load ice for the outfit cars, taking 40 minutes. Amazingly, we now have 57 cars and a total load of 3400 tons behind these 2—1000 hp. diesels! Who says you have to have 4500 hp. to haul 3000 tons?

We glide down the long descending grade into Bonners Ferry, where the Kootenai River flooded a whole valley and broke through the railroad embankment 2 years before, shutting down the S.I. for several days. We arrive at Bonners Ferry for a couple of hours of switching and shifting phosphate cars. The worst part of the run was the 9 miles of descending 1% grade into Bonners Ferry, where the track is very rough and the roadbed erratic.

Finally with our tonnage cut down to 2500, we are ready for the long uphill grind to the border, leaving Bonners Ferry at 5:45 after everybody went uptown for a snack and a spoof and a change of crews. Due to the long hours on this kind of a road-switcher run, freight crews change at Bonners Ferry. We now have 48 cars and 2450 actual tons. Engineer Dewey Almas should work on a Blue Line Tour bus! He knows every curve, rock, cliff and tree and every "Native" living beside the tracks. With Fireman Al Harvey running the twin diesel units, Mr. Almas proceeds to enthusiastically yank us out of the cab and out on the wide running board that runs clear around—and conveniently so—the entire engine compartment. As fascinated with his regular run as a boy's first trip, Dewey takes us out to the front platform, and Presto! the unlaxitating moment bursts on us! We are crossing the big viaduct above Bonners Ferry —about 600 feet vertically above—at about 9 mph. as the two diesels run wide open up the long 1% grade and their 2450 trailing tons. Rarely does one ever see a sight as magnificent as this. The wide deep valley below, with the River, Bonners Ferry and the Great Northern on the river banks far below. At one curve the sun set over the mountains to the West, behind which lies Priest Lake, one of the Idaho Gems. At another curve, the full moon over the Rockies near the Montana border. Suddenly, a sheer drop of a cliff, nearly 1,000 feet, and from a swaying diesel locomotive platform suspended over the tracks into sheer space, Engineer Almas and your correspondent practically see a couple of sea monsters way down thar' in the blue-green depths of the Kootenai River! The perspective is exactly and dimensionally like being held over the edge of the parapet atop the Empire State Building by one's heels as an enthusiastic guide points out the microscopic detail of the traffic in 5th Avenue 15/th of a mile straight down. However, the diesel sticks to the tracks and above this Death Curve, where passengers take one look and scramble for the opposite side of the coach—the terrain becomes a deep, silent river valley filled with trees.

Gradually as the swift Moyie River rises to the track level, the river and railroad grade ascend evenly at about ½% up to the border. We pause to pick up a car of lumber at Moyie Springs, leaving there at 7:20. After an hour's run we are at the border town of Eastport-Kingsgate, a raw, windy deep canyon at about 2600 ft. elevation in the giant mountain country where civilization is few and far between. Customs inspectors check the train and examine the contents of each car, as we take a 30 minute breather at the nearby roadside lunch stand, with its awful Canadian coffee. An hour later we're at the junction of the CPR and S.I. about 10 miles into Canada, and 3 miles more, and we are at Yahk, the rail terminal, and it's near midnight—18 hours out of Spokane. After a night's "rest" in the sole remaining hotel—the lumber and coal mines are gone and everybody is waiting for a second crop of pine trees to grow in the windswept Moyie River Canyon that turns east and north toward Fernie and Crows Nest Pass—a giant steam whistle is our alarm clock.

The Canadian Pacific Kootenay Express is leaving for the East. Soon the westbound Kootenay will arrive from Lethbridge to make connections with the southbound S.I. passenger train for Spokane. Of course, the CPR is an hour late, so by 9:50 we are off to Spokane. A car of fragrant cattle rides behind a boxcar of merchandise freight, behind the coach and baggage-mail car. At the tail rides the gayly painted caboose! The diesels are refueled and serviced only at the Spokane end. Turnaround times at Yahk are short and the engines are never stopped till they arrive back in Spokane—sometimes two full days on freights, and about 15 hours on the passengers. Emergency fueling can be had at Bonners Ferry if it looks like a tough run. Hour

**Alco switching at Sand Point, Idaho.**

The unique passenger consist above Bonner's Ferry, Idaho.

after hour at full load the diesels ran cool and with exceptionally clear exhausts. The whine of the superchargers at full load is a sound effect that after a while you don't hear. At first it drives you nuts. The train crews say it isn't as nerve wracking as the pound of the old steam exhaust, and after a time the ears get tuned above or below the supercharger whine and nobody hears it forever afterward.

The comparatively fast, daylight ride back on the neat but unpretentious passenger-stock combination was full of "operating surprises" and slowed only by the 12 miles of rough light track out of Spokane. We had a good comparative description from Engineer Robinson on steam vs. diesel on the S.I. passenger run, and how he and his fellow trainmen were glad to work on a passenger train that could preserve its future existence with slim passenger travel, by means of hauling high-value freight and livestock so the revenues would equal expenses or better and give better service to shippers.

Many railroads do not have the "Family Spirit" among its crews, and if a single carload of produce or livestock ever rode a passenger train—even a dying one about to be annulled for lack of revenue —Presto—and they'd clamp the expensive status of mixed train on it and milk it for freight hours and passenger mileage and switching time besides! So it looks like the one passenger train on the S.I. will outlast many other passenger trains in the West, where the already thin volume of traffic is being wooed to parallel highways. We arrive in Spokane's big Union Station nearly an hour late, at 3:10 p.m. On some stretches we hit 60 briefly, but generally stayed in the 40 mile speed range. The passengers loved the fun of riding ahead of a carload of live cattle. But the trainmen coyly admit when the wind is coming from the tail, the nostrils sometimes curl and the passengers momentarily lose their sense of humor! In 1951 five more miles of 90 lb. rail will be laid near Bonners Ferry and five near Spokane. The speed limit is 35 on the 72 lb. rail and 60 on the 90 lb. all over the line.

Since all Alco diesels are of exactly the same type, and all have supercharged 6 cylinder 12½ x 13 4 cycle diesels, shop practices are not complex and a regular preventive maintenance schedule is followed. The large cabs permit plenty of space for extra water tanks to feed the 1600 lb. vapor boilers used for train heat on two of the 9 diesels. A road-freight diesel works just as well switching in the Spokane yards or hauling short cuts on the Coeur D'Alene Branch line. Diesel work is in charge of Messrs. C .R. Snitt and Herman Tackman, as diesel shop foremen. Statistically, the S.I. presents an unusually favorable picture in its last year with steam and its first year with diesels. In 1949 the freight gross ton miles were 217,437,000 and in 1950, they were 231,850,000. The total costs for system freight trains in 1949 were $439,692. In 1950 these same costs had dropped way down to $296,169! $143,000 less operating costs for 14½ million more ton miles! Boiled down this means that train mile costs, equated to thousands of gross ton miles, dropped from way over $2 to a cozy $1.27!

The fuel bill alone for 1949 was $139,342 which dropped, despite the high diesel fuel costs, down to $53,117. Locomotive repair costs for 1949 were $51,586 which dropped down to $30,354 in 1950! On the passenger side, fuel expense dropped from $13,904 way down to $1,927! In S.I.'s passenger service the fuel wasted in standby ready to run business of keeping the boilers warm cost over 3 times as much as the *total fuel cost* under diesel! Master mechanic at Spokane shops in charge of all rolling stock is Mr. Ray Wallin. And from the record, clear up to the statistics for the ICC and the company's own Board of Directors, it looks like he and Chief Engineer Williams were doing an excellent job with the newest 100% diesel railroad!

# FALLS CITY, NEBRASKA

## 2,800-Hp. Fairbanks-Morse Unit Generates Power At Fuel Cost of 3.15 Mills Per Kw.Hr.

*By* DOUGLAS SHEARING

A NEW 2,800-hp. Fairbanks-Morse dual-fuel engine is producing power in the Falls City, Nebraska, municipal plant at a total fuel cost of just 3.15 mills per kilowatt-hour. This economy is being achieved with 20-cent gas and 11-cent fuel oil and represents a saving of 63 percent compared with previous diesel fuel costs. The big engine is a Model 31AD18, with eight cylinders of 18 in. bore and 27 in. stroke developing rated horsepower at 277 rpm. This two-cycle dual-fuel unit drives a 1,984 kw. Fairbanks-Morse alternator with 25-kw. V-belted exciter.

The Falls City plant illustrates both modern engine economy and diesel durability. The first engine installed when the city switched over from steam power in 1926 was a 720-hp. Model 33 Style M Fairbanks-Morse diesel. Twenty-five years later, this same unit operates every day, teaming up with the new engine to carry the load. The story of this plant's expansion is the classic one, with successive installations of larger and larger engines. In 1928, an 840-hp. Style M went into service. Two years later, a 1,000-hp. unit of the same type was installed. In 1936, a 1,400-hp. Model 33D was put in. In 1942, a 1,600-hp. Model 33E was added. All of these were two-cycle, pump-scavenging, mechanical-injection Fairbanks-Morse diesels.

Finally, in December, 1950, the 2,800-hp. engine went into full service as a diesel and generated more than 1,000,000 kw.hr. in the next three months at an average of 14.07 kw.hr. per gal. of fuel. Then, in March, 1951, the unit was switched to natural gas and began to slash fuel costs in earnest. The first real indication of what could be accomplished was the first half of the city's fiscal year 1951-52, the period from May through October, 1951. In these six months, the new engine produced 2,442,000 kw.hr., 46.3 percent of the plant total of 5,263,700 kw.hr. This becomes significant when translated into dollars and cents because the dual fuel engine produced a kw.hr. at the following cost:

| | |
|---|---|
| Cost pilot oil | $0.00077 |
| Cost gas | 0.00238 |
| Total fuel cost | $0.00315 |

In the fiscal year 1950-51, the diesels averaged a fuel cost per kw.hr. of $0.00845. Thus, the new engine cut fuel costs 5.3 mills per kw.hr., a reduction of 63 percent. In the six-month period reported, this meant a saving of nearly $13,000.00.

A 30-32 gravity gas oil is used for pilot fuel. Stored in two 12,000-gal. tanks, it is transferred by a motor-driven pump through duplex bag-type filters to an elevated day tank from which it flows through a meter and another duplex filter to the separate pilot oil injection pumps on the engine. The natural gas reaches the plant at 35 lb., then passes through an orifice-type meter and a regulator which cuts it down to 30 lb., the pressure at which it goes to the engine. The engine can be switched instantly from dual fuel to full diesel operation and there is a second day tank for the 26 gravity diesel fuel. Fall City is in the midst of the oil fields and the viscous, paraffin-base fuel is delivered hot from a nearby supplier and stored in two steam-heated tanks with combined capacity of 48,000 gal. This is the oil used for all the diesels.

The SAE 40 lubricating oil is circulated under pressure to the bearings and up into the pistons by a built-in, engine-driven pump. Included in the circuit is a shell-and-tube oil cooler. Some lube is bypassed from the pressure side of the pump to a fuller's earth, cartridge-type filter from which it is returned to the crankcase. Cylinders are supplied by a pair of mechanical lubricators. The big engine has a separate cooling system with a pair of 6-in. centrifugal pumps driven by 20-hp. motors to circulate soft water through the engine jackets and the coils of an atmospheric tower. The tower is set in a pond in such a way that water level can be raised to cover the coils during the Winter. An 8-in. turbine pump puts water through the tower sprays. Either rain water or 12-grain city water is used for makeup. The latter is brought to 4 grain hardness in a zeolite softener.

Scavenging air is drawn through a vertical intake silencer into an air house holding 24 filter elements. The air is supplied to the engine by a blower driven by a 200-hp. induction motor which derives its power at 2400 volts from the generator of the engine served. A little 1-kw. dc. generator driven by a 2-hp. motor is used to force the generator field in starting to insure a quick surge of power for the blower motor. The big engine is fully equipped with automatic safety devices. The engine cannot be started unless lube pressure is brought up with the motor-driven auxiliary lube pump. The gas is shut off if scavenging air pressure, lube pressure, cooling water pressure or pilot oil pressure drops below prescribed minimums. If the gas supply fails, the engine switches automatically to oil.

This city of 6,200 population has some of the lowest electric rates in the state of Nebraska. Here is what Falls City consumers paid for electricity in the six-month period ended October 31, 1951:

| | |
|---|---|
| Residence Light Sales | |
| 4c | 573,652 kw.hr. |
| 3c | 421,382 kw.hr. |
| 2c | 717,281 kw.hr. |
| Commercial Light Sales | |
| 4c | 493,968 kw.hr. |
| 3½c | 623,356 kw.hr. |
| 2c | 96,104 kw.hr. |
| 1⅓c | 110,100 kw.hr. |
| Commercial Power Sales | |
| 3½c | 286,854 kw.hr. |
| 2½c | 62,000 kw.hr. |
| 2c | 186,360 kw.hr. |
| 1½c | 1,252,600 kw.hr. |

In spite of the low rates, the plant shows a substantial profit. In the six-month period under consideration, revenues totaled $132,930.74 while department expenses, including generation, distribution and administration, came to $81,552.29, leaving a profit of $51,378.45 for the half year. Table I gives the figures in detail. It will be remembered that this period reflects the economy of the new dual-fuel engine.

The plant is operated under the direct supervision of G. G. Wendt, Superintendent of the Water and Light Department, a man of long experience with diesel installation and operation. Policy matters are handled in consultation with Mayor Paul Zimmer and the six-man city council. Councilman Harold B. Bedwell is chairman of the Water and Light Department.

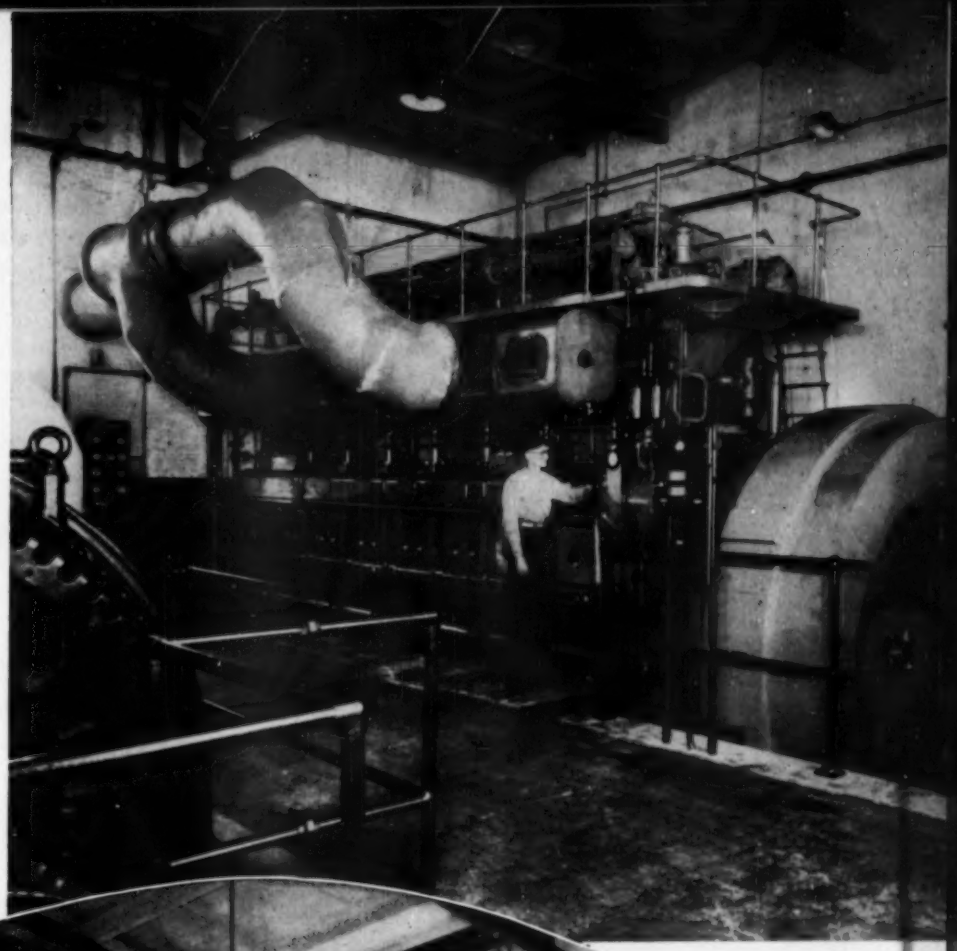
### Electric Department Operations Statement - May 1 to Oct. 31, 1951

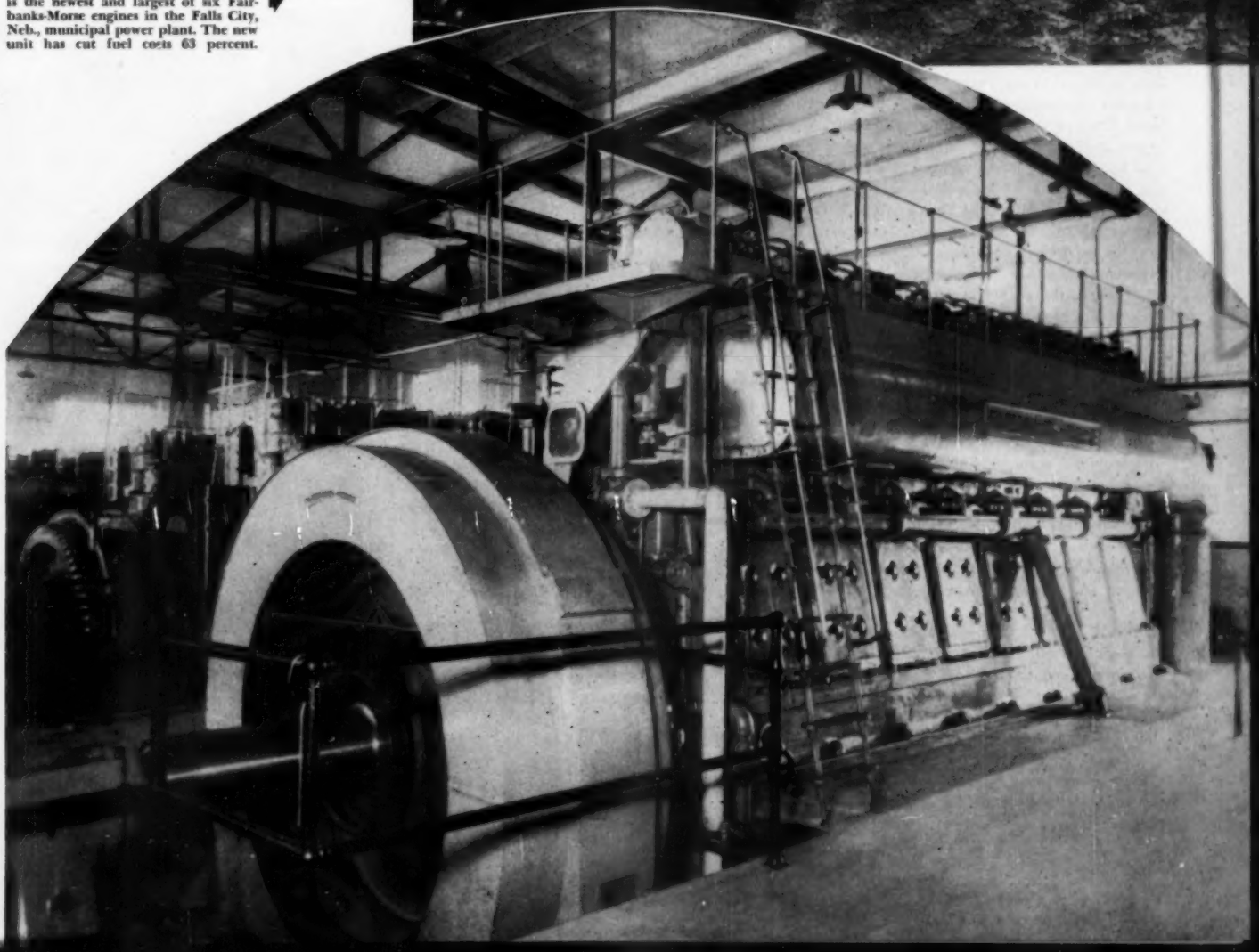
| | | |
|---|---|---|
| REVENUE | | $132,930.74 |
| EXPENSE: | | |
| *Generation Operation* | | |
| Supervision | $ 837.82 | |
| Engine Room Labor | 6,432.63 | |
| Misc. Labor | 4,486.01 | |
| Supplies & Expenses | 1,292.22 | |
| Auxiliary Power | 2,079.23 | |
| Fuel Oil | 26,104.19 | |
| Gas | 5,981.95 | |
| Lubricating Oil | 3,839.50 | |
| Water | 614.51 | |
| Total | | 51,668.06 |
| Generation Maintenance | | 4,111.74 |
| Distribution Operation | | 5,675.02 |
| Distribution Maintenance | | 3,375.66 |
| Administration | | 9,930.84 |
| Other Expense (Insurance etc.) | | 6,790.97 |
| TOTAL EXPENSE | | 81,552.29 |
| ELECTRIC DEPT. PROFIT | | $ 51,378.45 |

## List of Equipment

Engines—One 2800-hp., 8-cylinder, 18 x 27-in., 277 rpm., Model 31AD18 dual-fuel. One 1600-hp., Model 33E16 diesel. One 1400-hp., Model 33D16 diesel. One 1000-hp., Model 33 Style M diesel. One 840-hp., Model 33 Style M diesel. One 720-hp., Model 33 Style M diesel. All engines are Fairbanks, Morse & Co.
Generators—Fairbanks, Morse & Co.
Governors—Woodward Governor Co.
Fuel transfer pump—Roper.
Fuel filters—Wm. W. Nugent & Co.
Fuel meter—Buffalo Meter Co.
Gas meter—Bristol.
Lubricating oil—Vacme No. 4. Socony-Vacuum Co.
Cylinder lubricators—Madison-Kipp.
Lube cooler—Ross Heater & Mfg. Co.
Lube filter—The Hilliard Corp.
Auxiliary lube pump—Viking Pump Co.
Cooling water pumps—Fairbanks, Morse & Co.
Intake silencer—Maxim Silencer Co.
Air filters—American Air Filter Co.
Scavenging air blower—Roots Connersville.
Blower motor—Fairbanks, Morse & Co.
Motor-generator set—Fairbanks, Morse & Co.
Exhaust silencer—Maxim Silencer Co.
Exhaust pyrometer—Alnor. Illinois Testing Laboratories, Inc.
Switchboard—General Electric Co.

**The 2,800-hp. dual-fuel engine at right is the newest and largest of six Fairbanks-Morse engines in the Falls City, Neb., municipal power plant. The new unit has cut fuel costs 63 percent.**





# THE MARINE STORY OF THE YEAR

## Michigan State Highway Department's Ice Breaking Ferry Goes Into Service — 9300 Shaft Horsepower of Nordberg Diesels Driving Through Westinghouse Electro-Magnetic Couplings

By DWIGHT P. ROBISON

ENTRY of the *Vacationland*, Michigan State Highway Department's new ice-breaking ferry, in service in the Straits of Mackinac, marks a notable shipbuilding achievement in the United States. The new vessel, distinguished as the world's largest double-ended ferry, is powered by four 2360 hp. Nordberg direct-reversing diesel engines and has a capacity of 150 vehicles and 650 passengers. It was designed and built by Great Lakes Engineering Works, River Rouge, Michigan to meet the requirements established by the Highway Department at a cost of approximately four and a half million dollars. She began regular operation between St. Ignace and Mackinaw City in January of this year.

The *Vacationland* was built under special survey of the American Bureau of Shipping for ice-breaking service on the Great Lakes. With an all-electric welded steel hull, the new ferry is 360 ft. long with a molded beam of 73 ft. 6 in. and depth to the spar deck of 43 ft. 4 in. Her hull was designed espécially for navigation in ice and has 12 transverse watertight bulkheads. These are spaced so that the vessel will not sink or capsize with any two compartments flooded. All sections are well rounded and waterlines show few parallel areas.

Scantlings are extra heavy in order to withstand the shock and impact of operation in heavy ice. Passenger accommodations and observation rooms are provided in a steel house above the car deck. On the deck over this house are the two completely equipped pilot houses and crew's quarters.

Completion of the *Vacationland* is an important step in the Michigan State Highway Department's program to relieve the severe traffic bottleneck which has developed in the Great Lakes area. To satisfactorily handle the *Vacationland* as well as the present endloading ferries, new docks have been constructed at both St. Ignace and Mackinaw City. The dock on the northern peninsula is constructed about 1¼ miles south of the St. Ignace dock and has shortened the route from 7¼ miles to 6 miles. As early as 1946, Michigan State Highway Commissioner Charles M. Ziegler and other department officials recognized that additional ferry service was needed and that the next vessel added should be designed for year round service.

Commissioner Ziegler delegated G. M. Foster, Deputy Commissioner of the Highway Department to direct planning and the building of the new ferry boat.

The plans and specifications were written to permit bidders to submit bids on three alternate types of propulsion: (1) oil fired steam uniflow, (2) diesel-electric and (3) diesel direct drive with electric couplings. After an extensive and detailed study of all factors involved the contract was awarded to Great Lakes Engineering Works on the basis of its bid of $4,314,000 for the diesel direct-drive with electric couplings as against its bid of $3,972,000 for the steam uniflow. The lowest diesel-electric bid was $4,557,000. Professor Louis A. Baier, Chairman of the Department of Naval Architecture and Marine Engineering, University of Michigan, was retained as owner's consultant in the design of the ship and selection of its propulsion system.

Several important factors influenced the selection of the Nordberg direct-reversing diesel engines for propelling the *Vacationland*. A dual purpose ship

was required that not only had to be fitted with high power for ice breaking, but it also had to operate economically in open water with but a fraction of its total installed power. The propulsion machinery would have to be extremely flexible in order to adjust the operating schedule to fluctuating traffic loads. Summer week end and holiday traffic is extremely heavy. Service at such times must be faster than it is on week days when the burden is comparatively light. Above all else, a vessel was desired that would satisfy these requirements at minimum annual expense for operation and fixed charges. In this respect the diesel direct drive showed decided advantages over other propulsion systems submitted for the new ferry.

When the basic design of the ship was completed, comparative operating costs of three proposed propulsion systems were calculated on the basis of the Highway Department's operating schedule. These operating costs were predicated on guaranteed fuel and lube oil consumptions, anticipated maintenance, fixed costs and charges, and operating personnel. From the detailed studies made of the vessel's operating cost, it was concluded that the direct diesel drive would show a substantial saving over reciprocating steam propulsion and diesel-electric drive.

The four Nordberg two-cycle direct-reversing diesel engines propelling the *Vacationland* have eight cylinders of 21½ in. bore and 31 in. stroke and are of the trunk piston, solid injection type each fitted with one attached engine-driven Roots-Connersville scavenging air blower. Each engine develops a continuous rating of 2360 bhp. at 165 rpm. and the total installed normal shaft horsepower is 9300. This is equally divided between four propellers. Full power on all screws will be used only in severe ice conditions in the Straits. For open water service, schedules are maintained with reduced power, using two engines each way. The machinery space is divided into two separate watertight engine rooms which occupy a total length of about 88 ft. in the midship portion of the ship. Both engine rooms are arranged so that ample room is provided for access to the main engines and all auxiliary machinery. Because of the vessel's double ended design, the main engines are arranged in pairs, two in the after portion and two forward of the center bulkhead. It is interesting to note that although this is a double ended vessel, one end is arbitrarily designated the bow and the other the stern. These are clearly marked by label plates at strategic points throughout the ship.

Starting air for the engines is stored in four receivers. There are three starting air compressors of 74 cfm. capacity capable of compressing the air to 250 psi., at which pressure it is delivered to the starting air valves. Two cooling water systems are provided—one for each pair of engines. Each system consists of a jacket (fresh) water pump and a raw (lake) water pump mounted on a sub-base with a common driving motor. The lake water suction is normally taken from a system composed of 12 interconnected sea cocks with steam thawing connections and spaced along the bottom of the ship. In the event these connections become plugged with ice, the space between the ship's shell and tank top under the engine rooms will be used for recirculative cooling of lake water for use in the heat exchangers for jacket water and lubricating oil. Spare pump sets are included for both raw water and soft water systems.

Intake air for the Nordberg propulsion engines may be taken direct from atmosphere, from engine rooms or from atmosphere through chambers around exhaust mufflers and piping for pre-heating. This flexible arrangement is designed to ease engine starting and the effects of severe cold on the engines during the winter season. This is accomplished by an especially designed intake air duct and valve system manually operated remotely from the engine room level. Fuel oil is carried in bunker tanks located fore and aft of the engine rooms. Seven tanks with a total capacity of 147,719 gallons provide heavy fuel oil storage for the main engines and four tanks have a capacity for storing 26,091 gallons of light fuel oil for the auxiliary generating engines. Main engine fuel oil is taken from heated bunker tanks and is heated and centrifuged and routed either to a heated clean oil bunker tank or to the heated daily service tanks. Heaters are provided between these tanks and the main engine fuel headers. Heat is supplied from steam generated by the ship's heating boilers. The entire fuel system is designed to facilitate the burning in the main Nordberg engines of viscous and low quality residue oils from the many native wells and refineries in the central area of the state of Michigan.

Due to the fact that this vessel was placed in operation in the middle of winter, it was decided to use a #2 fuel oil for diesel auxiliary generating sets and an oil of approximately 26 gravity with 3½% carbon residue, ½ of 1% sulphur, 25°F pour point with a flash point of 225°F for the initial break-in and educational period. It is contemplated that later on a still heavier and poorer quality of fuel oil will be burned in the slow speed, heavy duty main engines. Individual lubricating oil sumps, pumps, coolers, strainers and filters are provided for each of the four propulsion engines. Main engine lube oil sumps have steam heating coils. The demand for auxiliary electric power on the *Vacationland* is supplied by three Nordberg diesel generating sets which are located adjacent to the two main propulsion engines in the forward engine room. Engines for these sets are of the four-cycle supercharged type with seven cylinders of 9 in. bore and 11½ in. stroke. Each engine, Nordberg Type FS-97-SC, is rated 560 bhp. at 720 rpm. and is directly connected to a 385 kw., 230 volt, three phase, 60 cycle Westinghouse generator with direct-connected exciter.

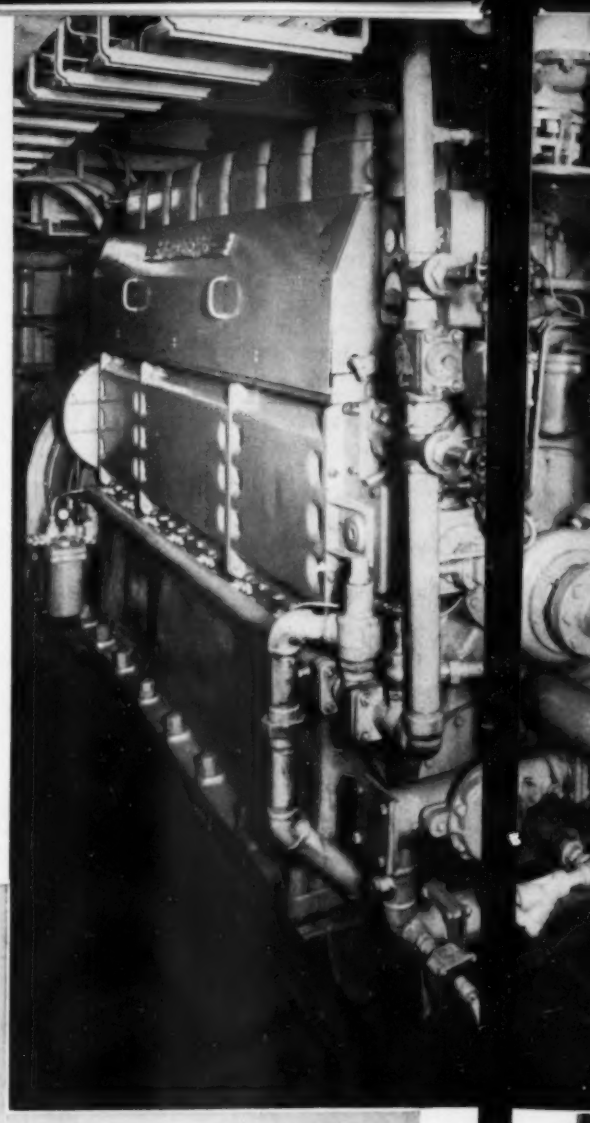
**Operating side of one of two 2360 bhp. Nordberg direct-reversing diesel engines in the forward engine room of the Michigan State Ferry *Vacationland*. Section of the Westinghouse electric coupling is visible at extreme end of engine.**

In the cooling water system on the *Vacationland*, jacket water from the auxiliary engine in use is circulated through the two main engines that are stopped. These two engines thus are kept warm and act as radiators, cooling the auxiliary engine jacket water. Circulation of the auxiliary engine jacket water to either pair of stopped main engines is manually controlled by valves in the piping which includes all three auxiliary and four main engines in a circuit. Each Nordberg engine drives a three-bladed 12 ft. 3 in. diameter by 9 ft. 3 in. pitch steel propeller through a Westinghouse electro-magnetic slip coupling rated 236 bhp. at 165 rpm. Kingsbury thrust bearings are installed on the propeller shafts between the couplings and propellers. The electric couplings provide a number of operating features particularly desirable in ferry service. They act as clutches which permit bow propellers to "windmill" when bow engines are not in use and the vessel is being propelled by the two after propellers. When the vessel is working in heavy ice, the couplings dampen shock torques from propellers through line shafts to engines.

Because of the electric slip couplings ability for quick connection or disconnection through simple control of excitation circuit, easy and quick starting and reversing of the diesel engines is possible. This results in a flexible and maneuverable ship.

The couplings also allow application of almost instantaneous high torque, which might be required when attempting to free a propeller which is stopped by the ice. In this case the engines are started and brought up to about two-thirds speed with couplings disengaged. The maximum coupling field is then applied instantly by the operator ushing a control button. Coupling excitation is applied in two steps normally. During starting or reversal of engines, reduced excitation is applied for a short interval with corresponding reduced torque to eliminate possibility of engine stalling during such maneuvering. Full excitation comes on automatically after a predetermined time interval. Under full excitation, coupling will transmit the normal load with a slip of 1.15%. The coupling is capable of developing 175% of full load torque which is sufficient to stall the engine in case the propeller becomes jammed in the ice.

For dead slow operation of propellers, a second and greater reduction in excitation is available under manual control by operators. This allows coupling to operate at high slip for indefinite periods with very low torque transmission and low propeller speed. With propulsion engines working



**Upper deck of the *Vacationland* showing the two pilot houses, crew's quarters, stacks and life boats. This Ferry, largest of its type in the world, is propelled by four 2360 bhp. Nordberg direct-reversing diesels through Westinghouse electric couplings.**

at 100 rpm., the propeller speed can be varied between 20 and 100 rpm. as desired. The coupling excitation is as reliable as the other essential electrically driven auxiliaries which include the steering gear and vital engine auxiliaries. In order to protect these, provision has been made so that, when any two ac. auxiliary generators are in operation and either of them fails, ship's load will be automatically released by tripping of feeder circuit breakers, in the order of importance, maintaining the ship's functions of steering, main engine auxiliaries, electric coupling excitation and other vital feeds up to an electrical overload of 110%.

The Nordberg propulsion engines and their electric couplings are controlled from two central stands, one in the after engine room and the other in the forward engine room. Operating signals are transmitted from both pilot houses to control stands by conventional engine room telegraphs plus wrong direction alarms.

## List of Equipment

Main Propulsion Engines—Four Type TSM-218-31, two-cycle, direct-reversing, 21½ in. x 31 in., eight cylinder diesel engines, each rated 2360 bhp. at 165 rpm. Nordberg Manufacturing Co.

Auxiliary Generating Engines—Three Type FS-97-SC, four-cycle, 9 in. x 11½ in., seven cylinder, supercharged diesel engines, each rated 560 bhp. at 720 rpm. Nordberg Manufacturing Co.

Auxiliary Engine Generators and Exciters—Three 385 kw., 230 volt, 3 phase, 60 cycle, direct connected generators and exciters. Westinghouse Electric.

Electro-magnetic slip couplings—Westinghouse Eectric.

Electric coupling excitation motor generator sets—Westinghouse Electric.

Thrust bearings—Kingsbury.

Exhaust mufflers—Burgess-Manning Co.

Exhaust pyrometers—Alnor. Illinois Testing Labs.

Intake air mufflers—Burgess-Manning Co.

Jacket water heat exchangers—Ross Heater.

Jacket water circulating pumps—Allis-Chalmers.

Lubricating oil coolers—Ross Heater.

Lubricating oil pumps—Quimby.

Lubricating oil centrifuge—Sharples Corp.

Fuel oil filters—Nugent.

Fuel oil booster pumps—Quimby.

Lubricating oil filters—U. S. Hoffman.

Alarm system—Viking Instruments.

Fuel oil centrifuges—Sharples Corp.

Main starting air compressors—Gardner-Denver.

Control stands—Nordberg Mfg. Co.

Scavenging air blowers—Roots-Connersville.

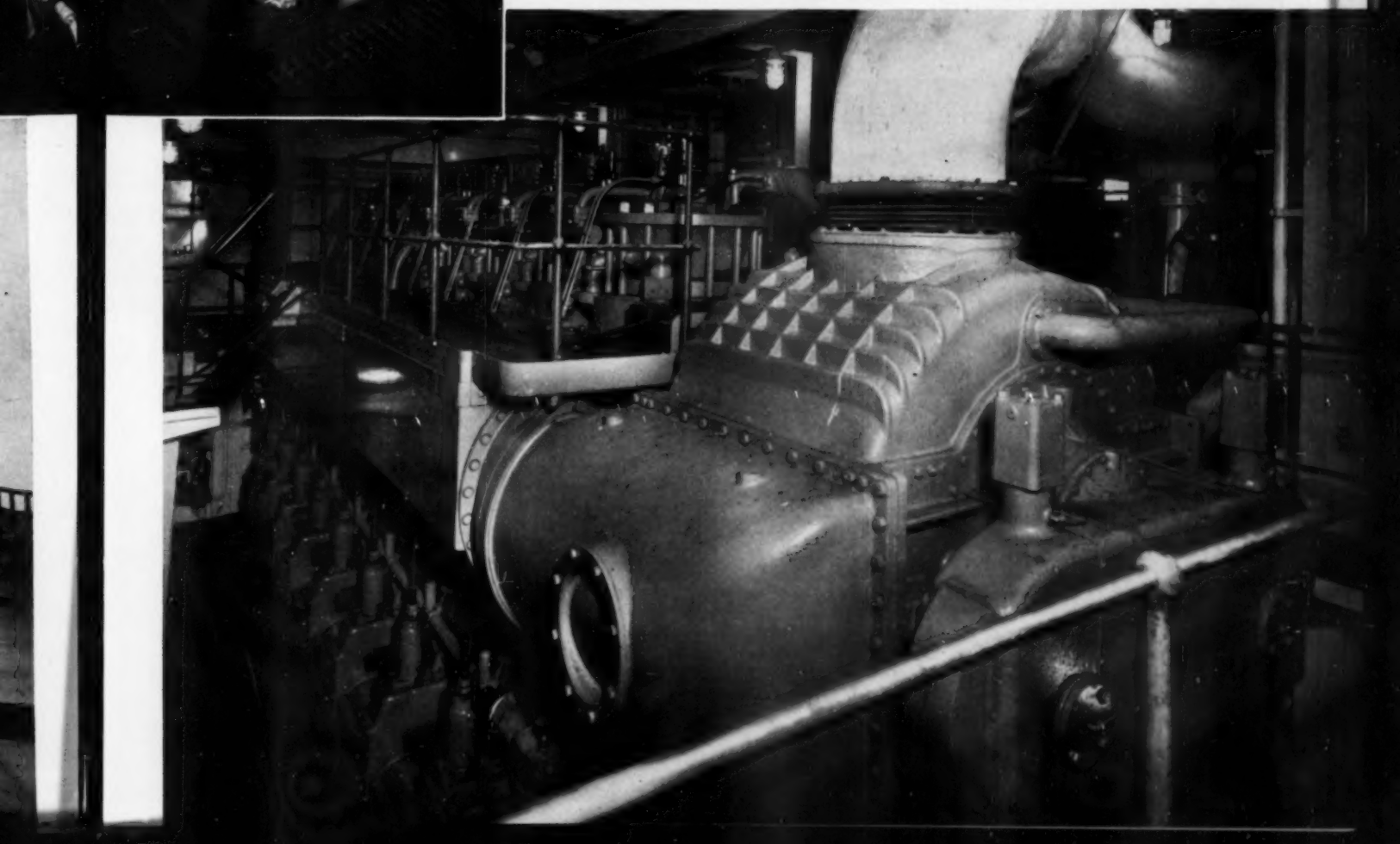
Fuel oil transfer pumps—Quimby.

Lubricating oil suction strainers—The Elliott Co.

Lubricating oil discharge strainers—The Elliott Co.

**One of three 560 bhp. Nordberg auxiliary diesel generating sets. Each engine is direct-connected to 385 kw. Westinghouse generator with direct-connected exciter. Also shown are Nugent fuel oil filters and Fulton-Sylphon thermostatic valve in jacket water system.**

**View from the upper engine room level showing the cylinder headers, Roots-Connersville scavenging air blowers, Zallea expansion joint of one of the two 2360 bhp. Nordberg direct-reversing diesels in the *Vacationland*'s forward engine room.**



# MORA, MINNESOTA

*By* EDWARD R. KENT*

IN the 16 years that Mora, Minnesota, has operated its municipal power plant, the city has doubled in population, plant generating capacity has increased 700 percent, power output 650 percent, and profits 360 percent. This impressive expansion in plant, production and profits are a tribute to the growing efficiency of diesel operation and to sound management of the municipal utility.

On Nov. 9, 1935, when Mora, with a population of 1,014, started generating its own electricity, the new plant had two Fairbanks-Morse, Model 32E14 diesels, one rated at 280 hp., the other at 210 hp. In 1938, plant capacity was doubled by the installation of a 500 hp., Model DS-6 Worthington diesel. In 1944, the plant was doubled again with the installation of a 1,000 hp. Model 33F16 Fairbanks-Morse diesel. Most recent expansion came in 1948 when the city removed the old 280 hp. unit and installed a 1,760 hp. Model ESH8 Worthington diesel. This brought plant capacity to 3,470 hp.

From 1936, the first full year of plant operation, until 1951, Mora's population rose to 2,038, but lower rates and better service than the city had ever known encouraged a much greater increase in per capita power consumption. Kilowatt-hours generated totaled 663,990 in 1936 and 4,370,360 in 1951. Peak load rose from 270 kw. to 1,060 kw. Through the years, the plant had to contend with the steadily rising price of fuel oil. A gallon of fuel cost 5.33 cents in 1936, 6.36 cents in 1941, 7.02 cents in 1946 and then zoomed to 11.82 cents in 1951. At the same time, the citizens of Mora were paying progressively less and less for their electricity. Revenue per kwh. consumed in 1936 was 4.89 cents; by 1951 the figure was shaved to 2.79 cents per kwh. Yet profits rose. In 1936, the gross operating profit was a tidy $15,918.87; in 1951, it reached $53,702.36. Other benefits to the community increased apace. The plant supplies free current for street lighting, parks and public buildings, a service valued at $2,100.00 in 1936 and at $12,584.15 in 1951.

Two factors were chiefly responsible for the continued rise of profits while income per kwh. declined and major items of operating cost rose. First, the increased volume of production tended to counteract the rise in unit cost of labor and other overhead. Second, the plant steadily improved its operating efficiency with resultant savings in fuel and lube consumption. A gallon of fuel yielded 10.9 kwh. in 1936, 12.2 kwh. in 1941, 12.4 in 1946 and 12.9 in 1951.

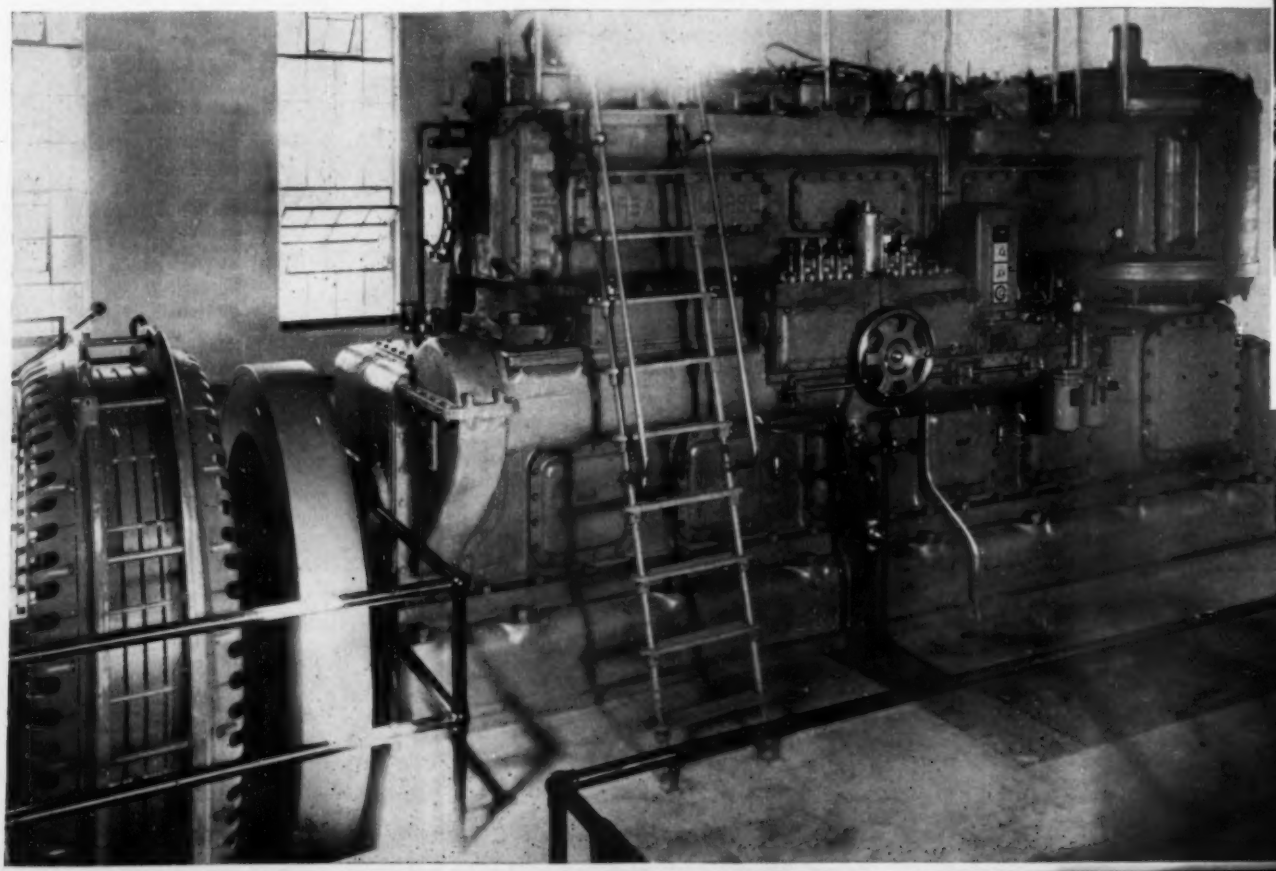
The prospects are for further improvement in fuel consumption as the growing load improves the operating load factor of the newest and largest engines. Evidence of the efficiency potential is the record of the 1,760-hp. unit which produced 6,705,400 kwh. in 12,570 hours while consuming 489,050 gal. of fuel. This is an average of 13.71 kwh. per gal. in spite of a load factor well under 50 percent. Continued load expansion this year means not only that the big engines will operate with enhanced efficiency but that a larger percentage of the plant's total production will be generated by the most efficient units.

Fuel, of course, is the big item of expense and fuel economies are of paramount importance, but other improvements have been effected. In the first year of operation, the engines ran 1,543 hp.hr. per gal. of lube consumed. Five years later, this figure was up to 2,833 hp.hr. In 1951, the plant averaged 3,390 hp.hr. per gal. of lube.

Each of the three largest engines is equipped with a clay-type lubricating oil filter for continuous operation and, in addition, the plant has a batch purifier. The latest engine was tied into the existing cooling water system since pump capacity was adequate to accommodate the added load. Jacket water is circulated by a pair of motor-driven centrifugal pumps (one 300 gpm. and one 500 gpm.) through the engines and shell and tube heat exchangers. Raw water is handled by another pair

*Superintendent, Mora Municipal Utilities.*

**The 1000 hp. Fairbanks, Morse diesel model 33F—16 x 20 unit was installed in 1944, has operated 26,089 hours, produced 11,709,350 kwh. with a fuel consumption of 933,570 gallons.**



of motor-driven centrifugals, one of 500 gpm. and the other 750 gpm. capacity.

Pumps, fuel day tanks, cooling water surge tanks, starting air compressor, intake air filters and vertical exhaust silencers are all housed in a long room added to the East end of the plant in 1944. The switchboard, located inside the original East wall, has five generator panels, a blank panel, one station panel and four feeder panels. The attractive brick building, in its setting of lawns and trees, serves a multiple purpose. The front of the structure houses the utility offices, the municipal jail, and the city council chambers. Behind this facade is the engine room with the diesels that pay their way. As it stands today, the plant represents an investment of $448,119.51. By the close of 1951, accrued profits of the plant totaled $513,462.57.

Every December, the Mora power plant sends its customers a Christmas present, a bill for the month marked "Paid." Actually, the plant is handing out presents the year around in the form of rates substantially lower than those in effect when the city started producing power. Free services to the city have the effect of lowering taxes. Undoubtedly one of the plant's important contributions has been to provide industry with a dependable source of economical electric power, a factor in promoting the city's growth and prosperity.

The Mora plant has reserve capacity today but city officials are looking ahead to greater production, efficiency and profits in the years ahead.

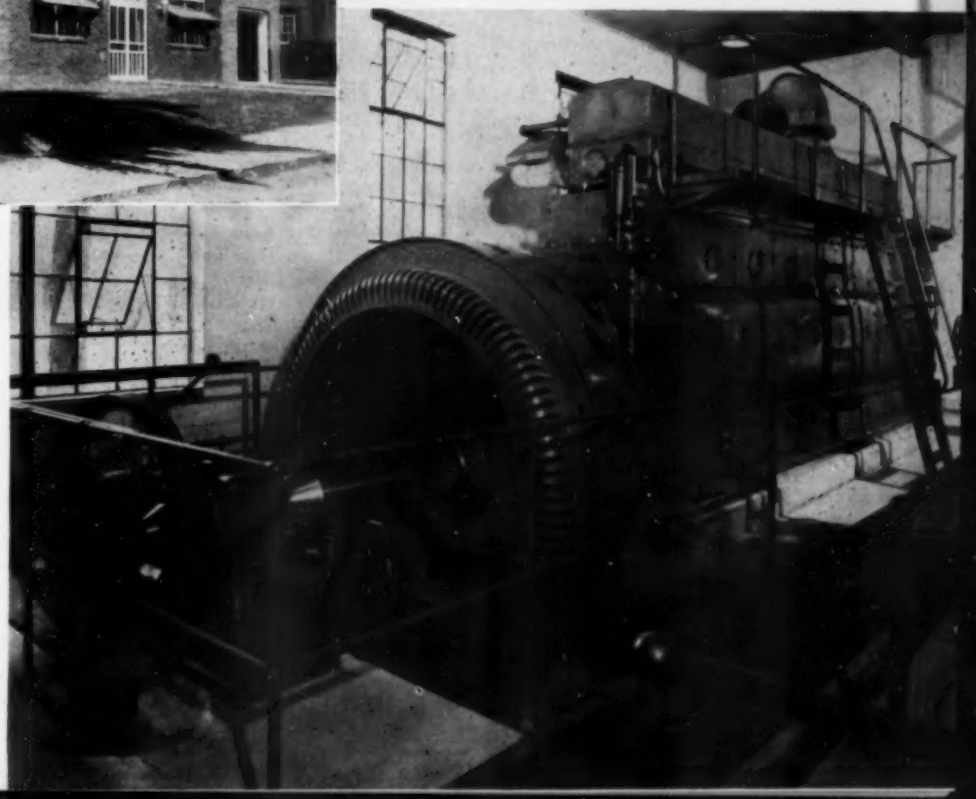
**MORA ELECTRIC UTILITY**

**TABLE I**

| | | 1936 | 1941 | 1946 | 1951 |
|---|---|---|---|---|---|
| 1. | Population (Census) | 1014 | 1494 | 1494 | 2038 |
| 2. | Kwh. generated | 663,900 | 1,325,300 | 2,424,820 | 4,370,360 |
| 3. | Station and line losses | 115,267 | 201,461 | 251,942 | 337,028 |
| 4. | Kwh. consumed | 548,723 | 1,123,839 | 2,172,878 | 4,033,332 |
| 5. | Electric sales | $26,739.17 | $ 36,486.66 | $ 62,688.73 | $112,568.22 |
| 6. | Other income | 128.50 | 225.03 | 951.28 | 2,938.30 |
| 7. | Total income | $26,867.67 | $ 36,711.69 | $ 63,640.01 | $115,506.52 |
| 8. | Net operating expense | $10,948.80 | $ 15,079.69 | $ 27,826.65 | $ 61,804.16 |
| 9. | Gross operating expense | $15,918.87 | $ 21,632.00 | $ 35,813.36 | $ 53,702.36 |
| 10. | Free services | $ 2,100.00 | $ 3,069.00 | $ 3,415.31 | $ 12,584.15 |
| 11. | Revenue per kwh. consumed | $ .0489 | $ .0324 | $ .0293 | $ .0279 |
| 12. | Operating cost per kwh. consumed (net) | .0200 | .0133 | .0128 | .0153 |
| 13. | Gross earnings per kwh. consumed | $ .0289 | $ .0191 | $ .0165 | $ .0126 |
| 14. | Fuel cost per gallon | $ .0533 | $ .0636 | $ .0702 | $ .1182 |
| 15. | Kwh. per gal. fuel oil | 10.9 | 12.2 | 12.4 | 12.9 |
| 16. | Hp.hrs. per gal. lube oil | 1543 | 2833 | 2455 | 3390 |
| 17. | Installed capacity in kw | 324 | 669 | 1362 | 2420 |
| 18. | Peak kw. load | 270 | 380 | 660 | 1060 |
| 19. | Firm power in kw | 138 | 324 | 669 | 1175 |
| 20. | Marginal power in kw | −132 | −56 | +9 | +115 |
| 21. | Number of meters served | 429 | 691 | 980 | 1368 |
| 22. | Total investment | $93,463.00 | $146,150.00 | $272,158.68 | $448,119.51 |
| 23. | Depreciation reserve | 3,743.00 | 30,016.00 | 68,012.72 | 164,810.73 |
| 24. | Book value of electric utility | $89,720.00 | $116,134.00 | $204,145.96 | $283,308.78 |
| 25. | Ratio of earnings to revenue | 59.2 | 58.8 | 56.3 | 46.5 |
| 26. | Return on depreciated investment | 15.9% | 16.2% | 13.3% | 12.3% |
| 27. | Accrued earnings to date | $15,918.87 | $118,071.00 | $268,257.36 | $513,462.57 |

**The Mora Municipal Power Plant building.**

**The 1760 hp. Worthington type SEH-8 unit was installed in 1948. It has operated 12,570 hours, produced 6,705,000 kwh. since then with a consumption of 489,050 gallons of fuel oil. Load factor has been extremely low, but will improve as load builds up.**



## List of Equipment

Engines—One 1760-hp., Model SEH8. Worthington Pump and Machinery Corp. One 1000-hp. Model 33F16. Fairbanks, Morse & Co. One 500-hp., Model DS-6. Worthington Pump and Machinery Corp. One 210-hp., Model 32E14. Fairbanks, Morse & Co.

Alternators—One 1245 kw. and one 345 kw. alternators. Electric Machinery Mfg. Co. One 693 kw. and one 138 kw. alternator. Fairbanks-Morse.

Switchboard—General Electric Co.

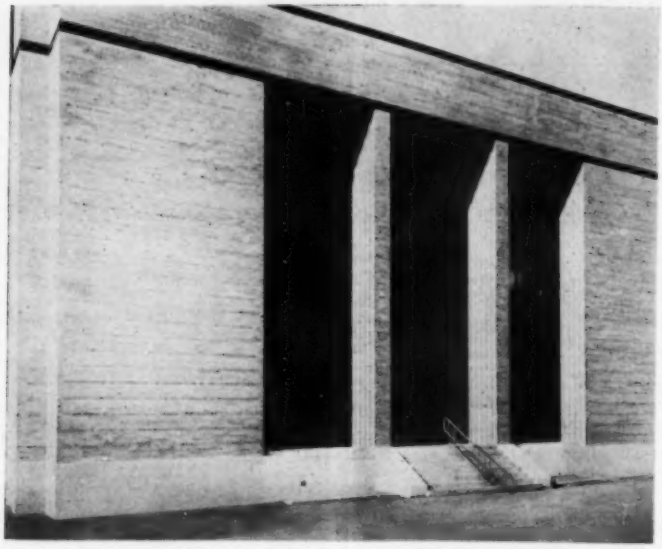
Lube oil purifiers—Honan-Crane Corp.

Lube batch purifier—Renuoil. Diesel Service Co.

Cooling water pumps—Fairbanks, Morse & Co.

Heat exchangers—Ross Heater & Mfg. Co., Inc.

Oil coolers—Ross Heater & Mfg. Co., Inc.



Entrance to Power and Pump building, Owl's Head Sewage Treatment Plant, Brooklyn, N.Y.

### Dual Fuel Diesels Supply All Power for New York's Newest Sewage Treatment Plant

# OWL'S HEAD

*By* VICTOR GREIFF, P.E.*

THE recent rapid progress of sewage treatment in this country demonstrates a widespread resolve to conserve America's natural assets of clean waters, regardless of the large expenditures necessary for treatment plans. Quite obviously the need for sewage treatment is greatest in extensive, heavily populated areas. This, and the efficiency possible in large sewage treatment plants as in any large process installation, has led to the development of mammoth plants, where the sewage of over a million population may be collected and treated. Every detail of such a plan calls for the utmost in engineering skill and judgment, and reliability in a class with public transportation and water supply, since the public health is involved.

All the basic sewage treatment processes depend upon settling out the contaminating matter by gravity, and permitting the purified effluent to pass on. This process applied to the sewage as received is called primary sedimentation, and is limited in its effectiveness because the pollution may be dissolved, or it may be of the difficult colloid class, or otherwise slow settling in nature. After a long history of experimentation along every conceivable chemical and physical line to complete this separation, aeration processes are in general use today, based upon phenomena found in Nature; analyzed and accelerated to the utmost, as hours of detention run into acres of tank structures.

In nature certain micro-organisms absorb the polluting matter, even from solution, then digest it, or settle out and permit the clean water to flow on. A modern sewage treatment plant harbors tons of these organisms, cleaning the sewage, settling out and being pumped back to start over again. This so called secondary treatment requires oxygen which is furnished by finely divided air, usually bubbled up from a depth of about 15 feet found to be the economic optimum. Outflowing water of almost any desired degree of purity can be obtained this way. The mass of organisms and entangled polluting matter grows rapidly, and the excess, called excess sludge, is added to the sludge from the primary process for disposal.

This problem is best solved today by another natural process of controlled decay away from air, termed anaerobic digestion, by which the volume is much decreased, most of the offensive organic material is destroyed, and an easily disposable fibrous slurry called digested sludge remains. In the process an amazingly reliable and comparatively large supply of gas is obtained, about 66% Methane, with $CO_2$ and small amounts of Nitrogen, etc. This gas is generally burned to keep the digestion process going at a best temperature, generally around 85-90 degrees F.

The sewage treatment plant needs power for several functions. Large plants collect from large areas by gravity, always deeper than the source, until levels of 20-30 feet below grade aré not unusual. The sewage must then be raised high enough to flow by gravity through the plant and out to the receiving stream or tidewater usually requiring a lift of 30-50 feet. This pumping ordinarily requires 200 or more kilowatt hours per million gallons treated. Aeration of .4 to 1.0 cubic feet of air per gallon of sewage, bubbled up from 15 ft. depth is a far greater power load, amounting to 300 to 750 kw. hours per million gallons. Plant auxiliaries

*Chief, Electrical Section, Department of Public Works, City of New York.*

**Six Superior, 8-cylinder, turbocharged, 1500 bhp., 327 rpm., dual fuel diesels and Westinghouse 1125 KVA generators supply all power to operate this sewage treatment plant having a capacity of 345 million gallons per day.**

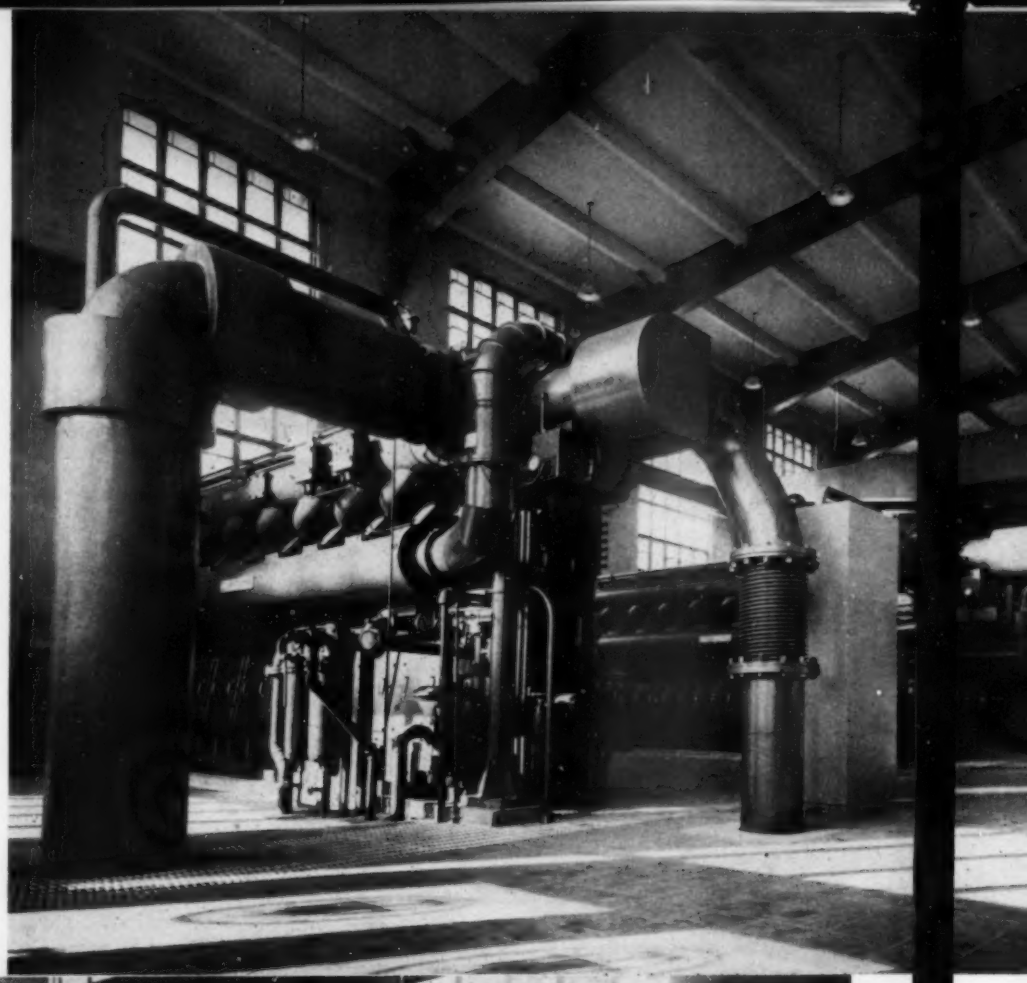
and lighting may be covered by 50 kw. hours per million gallons. So we may need from 550 to 1000 kw. hours per million gallons treated, depending upon the process and the conditions.

The gas produced by sludge digestion depends upon the richness of the sewage, and may be estimated as .8 to 1.2 cubic ft. per capita of contributing population per day; this is usually carried in 100 to 150 gallons of sewage per capita, so that from a low of 5300 to a high of 12,000 cubic ft. of gas may be obtained per million gallons of sewage. A considerable part, but rarely all of the power needed for the plant can be obtained from this gas, in addition to the heat rejected by the engines which can be used to supply the digesters and plant heating systems. This arrangement is inherently very efficient, over 90% of the thermal value of the gas being utilized either as power or heat.

From 60% to 90% of the power requirement for operation of the plant can be obtained from the digestive gas in efficient engines, requiring 10% to 40% of supplementary energy to be obtained otherwise. Also, since the plant load curve is irregular, especially in storm time, when the pumping usually is doubled, the power demand will peak, requiring temporarily a greater supplementary power supply. Power companies look with disfavor upon generation by their customers. They are authorized to make high charges for readiness to serve, and in addition are sometimes permitted to place prohibitive restrictions upon any alternative use of their service and other power. In fact it must be recognized that building a plant for generating power and requiring a power company to maintain duplicate facilities is uneconomic and likely to be expensive.

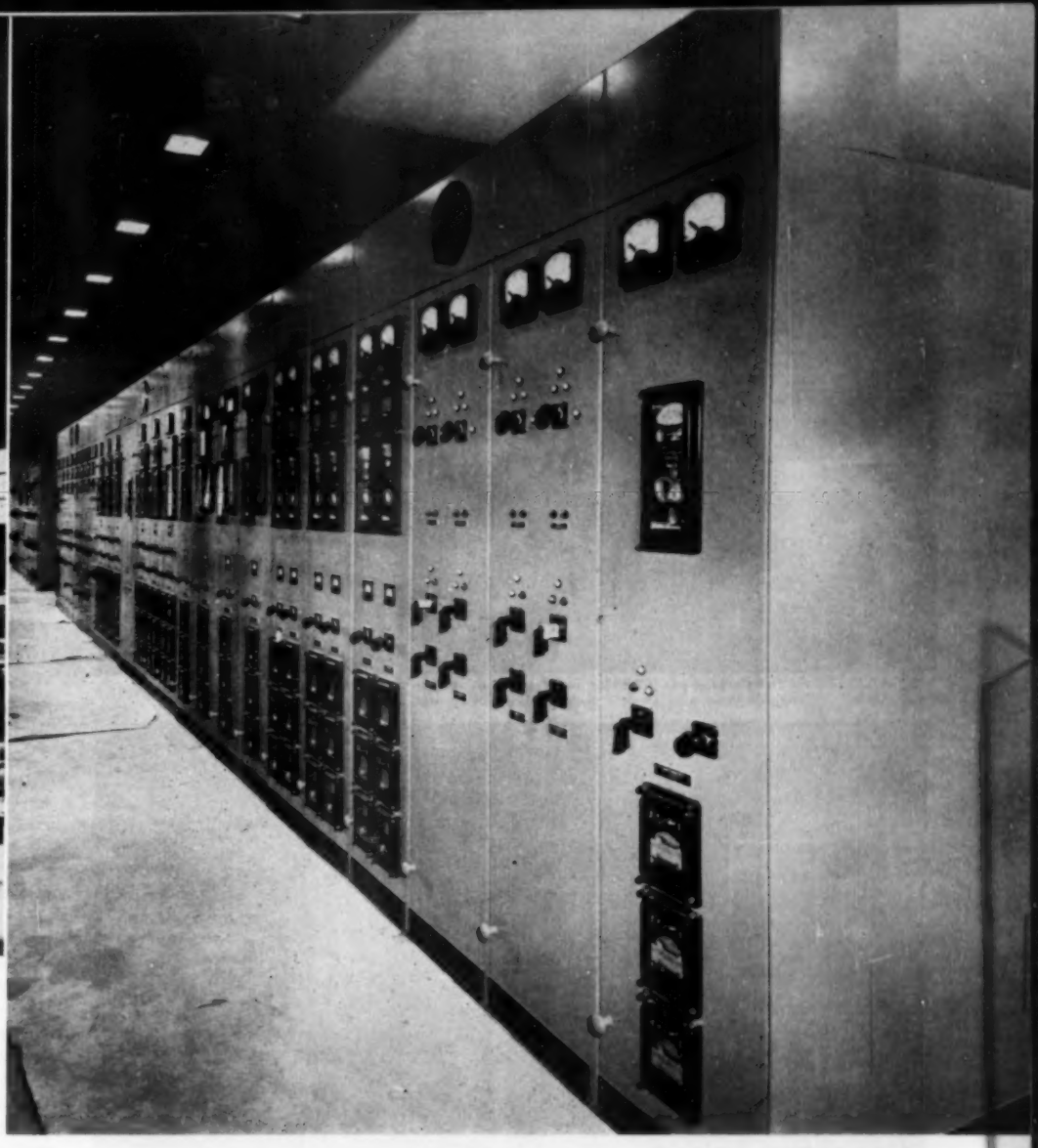
By the use of the dual fuel diesel, the same plant that utilizes the by-product gas, is operated on fuel oil to obtain the supplementary power, at a minimum of total fixed charges, and the cost of fuel merely for the amount of supplementary power required. Its reliability is a maximum because all units are of the same kind and the use of outside purchased power is eliminated. Somewhat over ten years ago, information was received that a sewage treatment plant in Australia was using a small British-built engine which used gas and fuel oil. World War II interrupted development somewhat, but engine builders were encouraged to convert to the new practice. During the war emergency a completed set of straight gas engines, built for the City of New York, was "stolen" from the factory floor, a rather usual occurrence at that time. After the war they were built for dual fuel, a clear technological gain, as plant construction was halted anyway.

As the operating cycle of the dual fuel diesel is followed, it appears extremely well suited for sewage plant work. The sludge gas and air mixture may be compressed to a satisfactory pressure without preignition, and the increase of oil injected when supplementary power is needed, involves no additional equipment. The small constant oil consumption for ignition is generally less than needed for supplementary power supply, so that no oil or gas is wasted. Governor arrangements for change-over to oil fuel are various, but automatic change-over on gas deficiency, without interruption of power is possible and of course ideal. These are the principles underlying the power setup of the



**W. J. Trabbic, job engineer for National Supply Company, starting No. 2 engine.**

On the foreground Superior engine are seen Purolator lube filters, Fisher gas pressure regulator, also three of the six Weston thermometers that monitor oil and water temperatures.



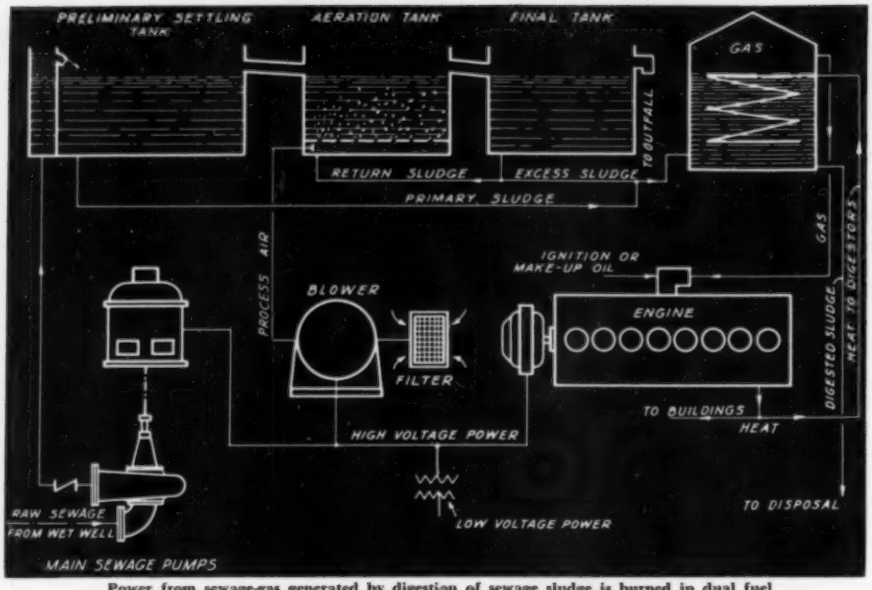
The main switchboard, built by Trumbull Electric Co., is fitted with G.E. equipment throughout.

new Owl's Head Plant, where digested gas will be burned in six, 1300 hp. supercharged Superior dual fuel engines driving 1125 kva. 4160 volt Westinghouse Generators, to furnish all the power for operation of the plant.

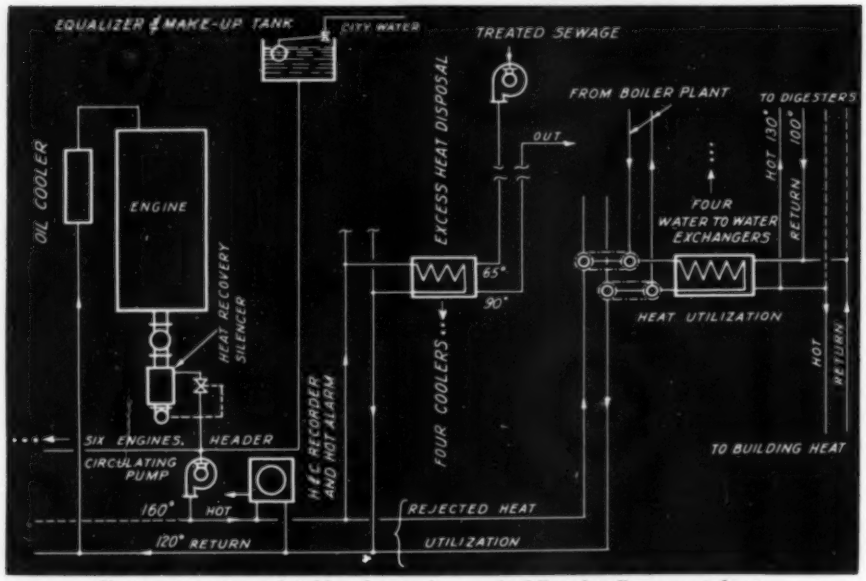
This ultra modern plant, an important part of New York City's pollution control program, is located just above the Narrows of New York Harbor, along the busy and beautiful Belt Parkway skirting a steep promontory known as Owl's head, and a fine park, above which is a choice residential area overlooking the Bay. The plant at this location, hotly opposed by the local property owners organizations, demanded unusual attention to beauty and to control of possible odors. All sewage and sludge handling equipment is housed and a ventilating system of 250,000 cfm. capacity routes all exhausted air through an ozone contact chamber and out of a discharge tower, positively destroying any trace of organic odors. The buildings were styled for great beauty and monumental permanence. The intercepting sewers capture the flow from sewers which previously emptied into the Harbor for several miles along the water front, originating in over 20 square miles of thickly populated area, with an ultimate population of 1,200,000 and a daily flow of 160 million gallons ultimately, and about 130 mgd. initially, from a population of about one million. Gas production of 1 to 1.2 million cubic ft. per day may be expected, from which 60,000-80,000 kwh. should be obtained. This is estimated as 90% of the plant's power requirement due to the use of a most economical aeration process, using under .5 cubic ft. per gallon. The power deficit will be made up automatically by the use of fuel oil by the engines, a minimum of less than 8% for ignition.

The plant is arranged for the "total generation" of electric power, i.e. all plant equipment will be electrically driven. The six 1300 bhp. Superior dual fuel supercharged engines are directly connected to Westinghouse Generators rated at 1125 kva.-.8pf., 3-phase, 4160 volts. Six identical units are ideal for reliability and maintenance. Fundamentally the Superior dual fuel engine simply substitutes a portion of gaseous fuel mixed with air for a corresponding portion of liquid fuel and the engine continues to operate on the diesel cycle with compression ignition. However, a lean fuel gas and air mixture will not ignite under the compression pressures and corresponding ignition temperatures found in the conventional diesel engine, so the gas-air mixture is compressed and then ignited or "fired" by a pilot charge of fuel oil which is injected at the proper time by the injection system. Depending upon the application and loading, the amount of pilot fuel injected will average about 5% of the total fuel oil required for full load diesel operation. The gas consumption varies from a few per cent at idling to over 90% of the total fuel at full load. The actual ratios and the economy in dual fuel operation will accordingly vary with the loading of the engine, and any deficiency in the gas supply is compensated by a corresponding increase in fuel oil automatically regulated by the governor.

The generators are connected through a compact but complete metal-clad switchboard to a main 4.16 pv. 3 ph. bus from which are operated the main




**Power from sewage-gas generated by digestion of sewage sludge is burned in dual fuel engines, generating electric power while exhaust and jacket heat are recovered.**




**Heat recovery system: rejected heat from engines may be delivered to digesters or to house heating. Heat may be added from oil fired boilers or taken away from jacket water coolers.**

pumps and blowers and transformers down to 440 volts for all auxiliaries and 120/208 volts for lighting and minor appliances. The engines, with auxiliaries below, the four 15,000 cfm. centrifugal blowers driven by 700 hp. 3600 rpm. motors, and the main pumps (2–85 mgd.-700 hp., 2–60 mgd.-500 hp. and 1–55 mgd.-450 hp.) are housed in the pump and power building, served by overhead cranes. The electrical control room is arranged for best view of the engines and main annunciator boards.

All possible provisions are made to insure continuity of operation with a minimum of attention, since the operator has a wide range of responsibility. To this end a specially designed annunciator and alarm in the engine room warns the engineer when his attention is needed by any of 12 major equipments. When 'Engines' is signalled, a large red lamp on one of the "Engine Alarm" boards will show on which unit the trouble is, while one of the 14 bulls-eyes on the panel will tell the exact trouble, including–low lube oil pressure, low water flow, high water temperature, overspeed (tripped), 2 journal temperatures (high), low manifold pressure, gas solenoid valve–operated, oil solenoid valve–operated, also, loss of electrical feed to the panel. The alarm and indication systems are operated from a 360 amp. hr. 60 cell, lead battery which operates switch-gear, motorized gate valves, and some important emergency lighting. The engine builders commissioning expert, constitutionally skeptical of customer's provisions, finally implied approval of this system to the extent of taking eyes off gauges and thermometers occasionally. Actually such electrical monitoring is an important adjunct to modern engine operation, making it possible for the operator to cover far more than the engines.

The heat recovery system is an interesting development of a low temperature system. Cool flow water enters the oil cooler on its way to the jackets (and pistons) and then through a water cooled exhaust pipe to the heat recovery exhaust silencer. At this point the flow is automatically by-passed until a temperature is reached safely above any possible dew point of the exhaust gases. This assures freedom from damage by sulphur oxides, derived from sulphur in the gas, in these heat recovery silencers. All the engines deliver this hot water into a common header, from which a motor driven centrifugal circulating pump for each engine draws, and delivers into a hot water pressure header. This permits any pumps to serve any engines. Make-up water is fed from an elevated tank into this suction line. This limits the static head on engine jackets to this elevation at the outflow end. The hot flow water passes through a bank of four water-to-water heat exchangers, individually valved on the output side to digesters or to the house heating system, while any of them may be fed with hot water from the oil fired boiler plant. This is an extremely flexible system and is provided with many dial thermometers for rapid supervision.

A Master temperature recorder guards engine flow headers and gives alarm on high temperature, which may occur when little heat is taken by the tanks and buildings. To meet this condition, part of the flow may be diverted through a bank of jacket water coolers through which purified and filtered effluent water is pumped and discharged to waste, taking the surplus heat with it. The governor control system of the engines keeps to a minimum the attention required by the engines. If, for any reason, such as low gas supply, low gasholder position, etc., the gas compressor control is tripped–no gas will be delivered, or it might happen that the gas is of insufficient thermal value. In such case, the governor will operate instantly and automatically to increase the oil fuel injected, thereby maintaining speed, and synchronism of all electrical equipment.

A signal light on the engine shows the use of more than minimum ignition oil and the main annunciator and alarm are actuated. The operator can silence the alarm and give any attention required by his gas plant. This arrangement gives a firm power supply similar to a well designed central station of similar size and type.

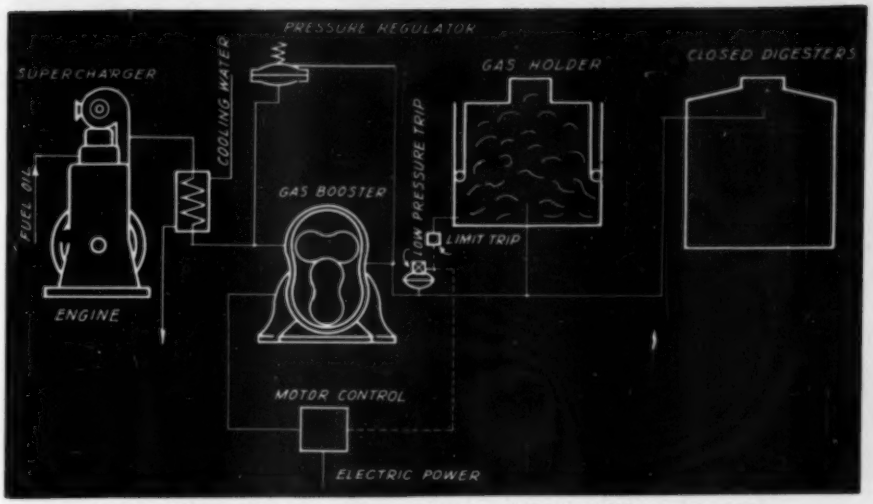
The Westinghouse 1125 kva., 4160 volt three-phase generators are connected through metal clad draw-out switchgear, to a main bus, sectionalized for maintenance, from which are directly operated the main pump and blower motors. The latter, each of 700 hp., and two 500 hp. synchronous motors driving pumps, take heavy starting inrushes, and in case only one generating unit is running this will exceed the rated current of the unit. To maintain satisfactory operating voltage and frequency under this condition makes great demands on the engine governor, voltage regulator, exciter and generator. All these must respond with the greatest speed, and still have great stability. Generally there will be several units running naturally making the system still more stable.

From the high voltage bus are energized two 600 kva. transformer banks for 480 volt three-phase power; this voltage being advantageous for the long distances found in plants of this size. From this auxiliary power bus in the power station two 75 kva. transformer banks feed the 120-208 volt four wire lighting system, making all lighting circuits 120 volts with one wire at ground potential, the grounded neutral. All transformer banks are somewhat oversize, and tie connections are provided so that every device down to a lamp or receptacle may be fed in two ways from different transformers or feeders, permitting repairs or changes without shutdown of any function.

The switchgear, motor driven valves, signalling system, and some emergency lighting, are supplied from the storage battery, which is automatically maintained at full charge by a motor generator of the diverter pole type. The generator and sectionalizing controls are concentrated on panels of the main switchboard opposite the main aisle of the engine room, a position where engine alarm panels, and main annunciator are visible, and an operator at any engine is also in sight.

The blowers for sewage aeration which constitute the principal load are four Roots-Connersville turbo compressors, direct driven by G.E. 700 hp., 4160 volt, 3600 rpm. wound-rotor induction motors. They are located in an adjacent room, but are controlled from the main switchboard, where their input kw. and their individual and total air delivery are indicated. Their control is automatic in starting, interlocked with their delivery valve, which opens when a blower pressure above the main header is established. Their speed is adjustable in a few small steps totalling less than 10%, designed to adjust the air delivery about 40% for control of the aeration process. The wound rotor motors also start the centrifugal blowers with a minimum of current inrush and consequent disturbance of voltage.

The pumps are vertical, located at self priming level in a pump pit, with motors on the engine room floor—two 85 mgd. driven by 700 hp., wound rotor motors, three 60 mgd. driven by 500 hp synchronous motors, and one 55 mgd. driven by a 450 hp. wound rotor motor. The wound rotor motors give easy starting and float control of pumping to match the flow, while the synchronous units are intended as major steps of base load to keep the generator power factor at a favorable value near unity.




**Automatic changeover: Low gas pressure or bottom position of gasholder stops gas compressor, shutting off gas supply, whereupon engine automatically changes over to oil fuel without interruption of operation.**

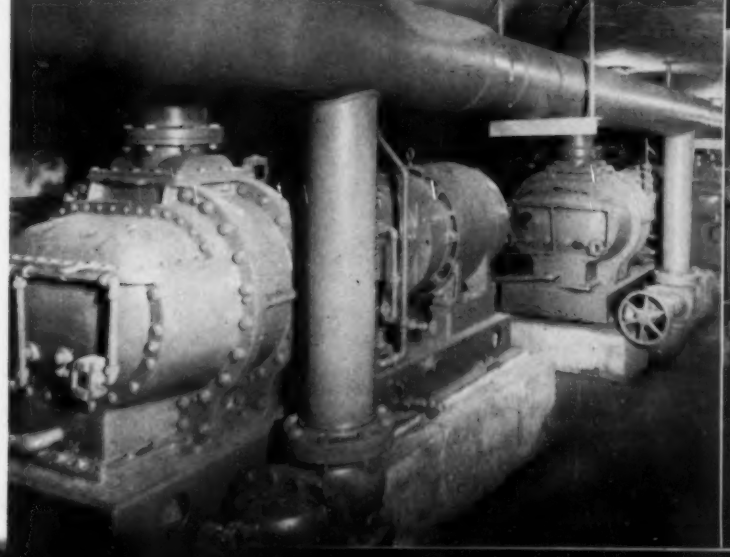
When the adjustable pumping unit is at the maximum or minimum point and still does not match the flow, the operator is signalled by alarm and the main annunciator. He then can add or shut down a fixed unit and the system will again adjust automatically. The functions of generation, pumping, and air supply thus require a minimum of attention.

The process of digestion is carried out in eight 100-ft. diameter closed concrete tanks, provided with heating coils, sludge circulating pumps and sludge transfer pumps, and connections to remove fluid and concentrate the sludge as the process permits. The finished digested sludge is pumped to a storage tank from which it is loaded into a motorship which takes it to sea for disposal. Increasing amounts of this sludge are being used for creating topsoil on the City's extensive water-front parkways which consist largely of hydraulic fill. The tanks are of interest for their size, and the structural problems and methods used in their construction.

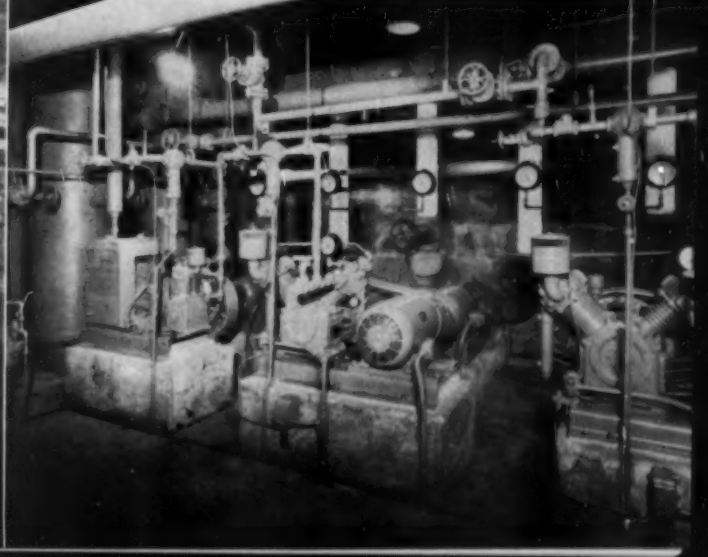
Since the digesters are closed rigidly, expansion and storage space for gas is furnished in a fabric sealed piston type gas holder, to hold any temporary excess of production over consumption until it is needed. High position and low position of the gasholder are reported by the main annunciator, while low position also stops the gas compressor, whereupon the engines run on oil. All motors for equipment drive are totally enclosed, fan cooled, except in the digestion area where both motors and wiring are of explosion proof types as used in the oil and gas industries. Electrical distribution and control devices are grouped in centers located in rooms isolated from sewage or sludge equipment.

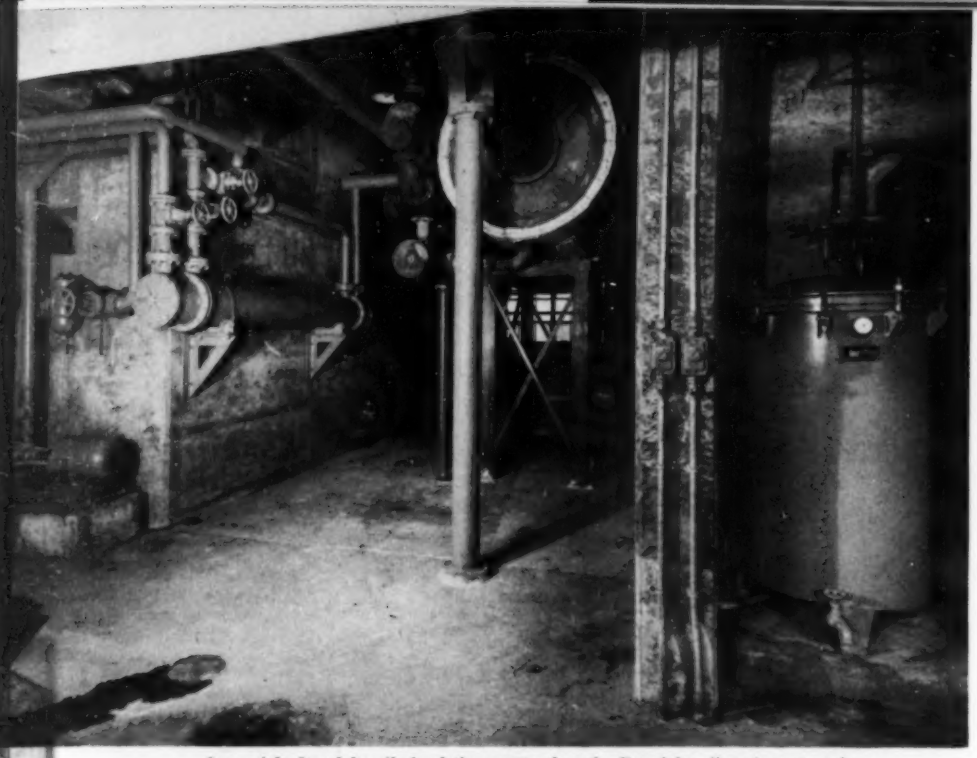
The enclosure of all sewage tanks, channels and equipment creates a problem in ventilation and a possibility of an offensive blast of polluted exhausted air. To meet this, ozone has been found effective, and a highly reliable electrical ozone generating plant of a type developed for water purification has been installed, capable of adding up

**Three Roots-Connersville blowers driven by Reliance motors raise pressure of gas to 15 psi. for use in the engines. After leaving blowers, the gas is passed through Ross heat exchangers to reduce its temperature.**



**Three Gardner-Denver starting air compressors, two driven by Electro Dynamic motors and one gasoline driven. Air storage bottles, left.**





**Lower left, Imo lube oil circulating pump, then the Ross lube oil cooler mounted on engine foundation, and upper center, the Maxim waste heat recovery exhaust silencer and lower right, the Hoffman lube filter. This equipment is duplicated for all six engines.**

to 15 lbs. daily of ozone to the exhausted gases in a chamber before their discharge into the upper air. A landscaping plan for the grounds is designed to correspond with the adjacent park development and to present a pleasing pattern from the air lanes above.

Plant design and construction supervised by the Dept. of Public Works, City of New York, Frederick H. Zurmuhlen, P.E., R.A., Commissioner, R. H. Gould, Director, Sewage Disposal, W. A. O'Leary, Chief, Bureau of Sewage Disposal Design, S. W. Steffensen, Project Engineer, H. Wetterholm, Chief, Mechanical Section, V. Greiff, Chief, Electrical Section, A. R. Glock, Chief, Bureau of Construction, Lee Magid, Resident Engineer.

Statements and views expressed are those of the author and not of the Department.

## List of Equipment

Main Engines: (6) National Supply Model 80-GDEX-8, dual fuel, 4-cycle, 8-cylinder, supercharged, 14½-inch bore, 20-inch stroke, 1300 bhp. at 327 rpm.

(1) Elliott-Buchi Turbocharger.
(1) Woodward U.G.8 Governor.
(8) Bendix-Scintilla fuel injection pumps.
(8) Weston Thermometers on cylinder head water outlets.
(1) Purolator-Duplex lube filter.
(1) Purolator-Duplex fuel filter.
(1) Alnor Pyrometer.
(1) Weston Tachometer
(1) Automatic Control Panel built by Trumbull Electric, with G.E. equipment.
(1) Helixhaust Exhaust Manifold.
(8) Thermocouples on main bearings—tied in with automatic alarm and shutdown.
(1) Fisher Gas Pressure regulator.
(2) Fuel oil meters each engine—Niagara Buffalo Meter Co. (1) on feed and (1) on return.

Note: One Bristol recording Thermometer is installed in the jacket water collector for all engines. One 10-ton Milwaukee Crane & Service Co. crane serves all engines.

Note: Automatic alarm and controls on engines are tied in not only with all engine functions but also with all operations in the plant, so that any abnormal condition anywhere in the plant will sound alarm and shut down the engines, automatically.

Note: The engines are equipped with push button conversion from oil fuel to gas fuel, also automatic adjustment to any ratio of oil fuel to gas fuel.

Blower Room:

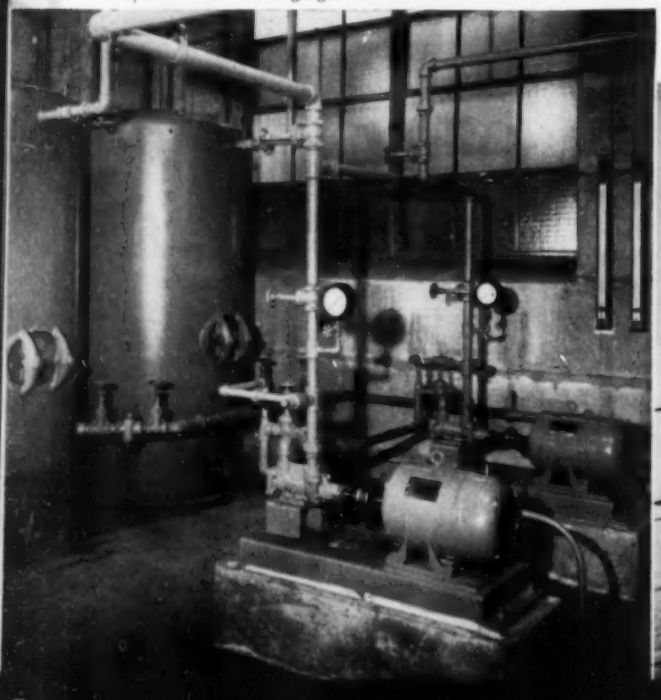
(4) Roots-Connersville Centrifugal Blowers. Each 15,000 cfm., 7.75 psig. Outlet Pressure, 3,600 rpm.
(4) G.E. Induction Motors, 700 hp.
(3) Roots-Connersville blowers, driven by
(3) Reliance Electric Motors raise pressure of gas from digester tanks from ounces to about 15 psi. for use in engines.
(3) Ross exchangers reduce temperature of gas leaving the blowers.

Note: The blowers (above) are fitted with Cuno lube oil filters and Ross lube coolers.

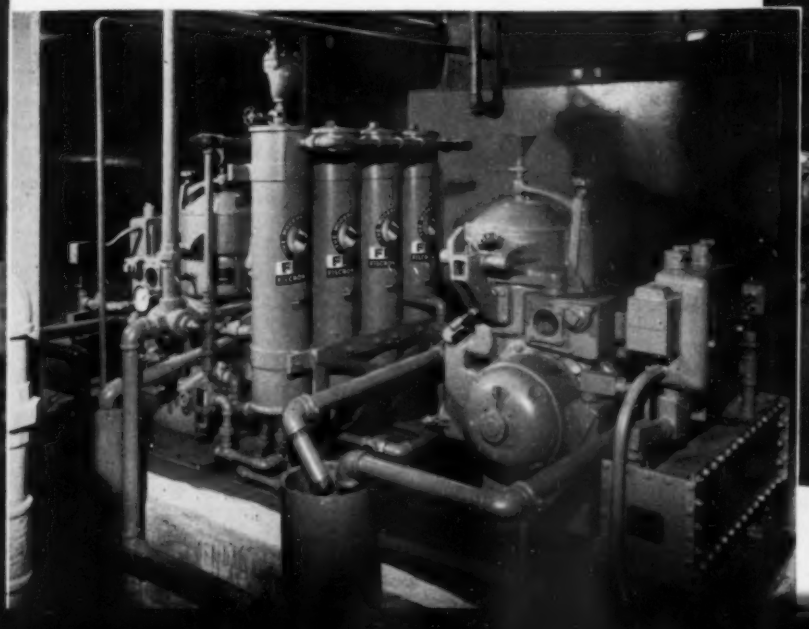
(1) Maxim Exhaust gas heat recovery silencer.
(1) Fulton Sylphon Thermo Valve on waste heat system—each engine.

Crane Valves and fittings on waste heat system.

**Lube oil storage tanks, 650 gal. each, and Imo lube oil transfer pumps. Upper right are the Petrometer tank gauges.**



**A pair of DeLaval centrifuges combined with Fram filters comprise this "Purifilter" installation for lube oil reclamation.**



Lube System:

(6) U.S. Hoffman Cartridge type purifiers.

(6) DeLaval Imo pumps; Electro Dynamic Motors; before and after circulating system with Crane strainer.

Note: All engine auxiliaries driven by Electro-Dynamic Motors. All electrical equipment in the plant is explosion proof.

Lube Storage:

(2) 650 gal. "new" oil tanks.

(1) 300 gal. "Dirty" oil tank.

(1) 300 gal. "Used" oil tank.

(1) 300 gal. "Reclaimed" oil tank.

(2) DeLaval Imo pumps for transfer of lube to engines; lube flows by gravity back from engines.

(1) Twin DeLaval "Purofilter"—combination of (2) centrifuges and (3) Fram filters on common base for lube reclamation.

(1) 300 gal. waste oil tank for sludge, water, etc., with (1) Imo pump to transfer waste out of plant.

One Gerin Oil Testing Kit.

Generators:

(6) Westinghouse A.C. 1125 kva., 327 rpm., Westinghouse 25 kw. exciter.

Jacket Water:

Closed jacket water system with

(6) DeLavel centrifugal circulating pumps

(4) Ross Exchangers

(4) Extra Ross exchangers for salvaging heat from jacket water when auxiliary boilers are not being fired (between seasons).

(2) Brownell boilers equipped to burn oil or gas for auxiliary heat.

Note: Effluent water is used for cooling jacket water —and wasted to bay—circulated by—

(3) Gardner-Denver centrifugal pumps.

Fuel System:

(2) Storage tanks—10,000 gal. each.

(6) DeLaval Imo presure pumps.

(3) Day Tanks.

(3) DeLaval Imo transfer pumps.

Battery of Ross jacket water coolers and heat recovery exchangers, four of each. Gauges are Ashcroft.

(12) Niagara Meters (Buffalo Meter Co.—one on pressure side and one on discharge side each engine.

(2) Petrometer (large) dial-type distance reading fuel tank gauges. Manufactured by Liquidepth Indicators, Inc.

Intake Air:

(6) American dry-type air filters.

Starting Air:

(2) Gardner Denver Compressors (motor driven)

(1) Gardner-Denver Compressor (LeRoi engine driven).

(4) Air Storage Bottles, 250 psi.

(4) Manning, Maxwell & Moore Pressure Gauges.

General:

(4) Gardner-Denver Air Compressors, V-belted to 75 hp. Continental Motors and fitted with Staynew Intake filters supply "Motive Air" for general use in plant-cleaning generators, blowing pipes, etc.

(4) 90 psi. storage bottles.

(4) Roots-Connersville blowers driven by G.E. 700 hp. motors and fitted with

(4) Maxim Silencers supply air for main aerating room. Each blower fitted with DeLaval lube centrifuge.

Carbon steel helically corrugated flexible intake and exhaust vibration absorber hose manufactured by Allied Metal Hose Company of Long Island City, New York.

Main Sewage Pumps:

(6) Worthington centrifugal driven by

(3) G.E. 500 hp. motors.

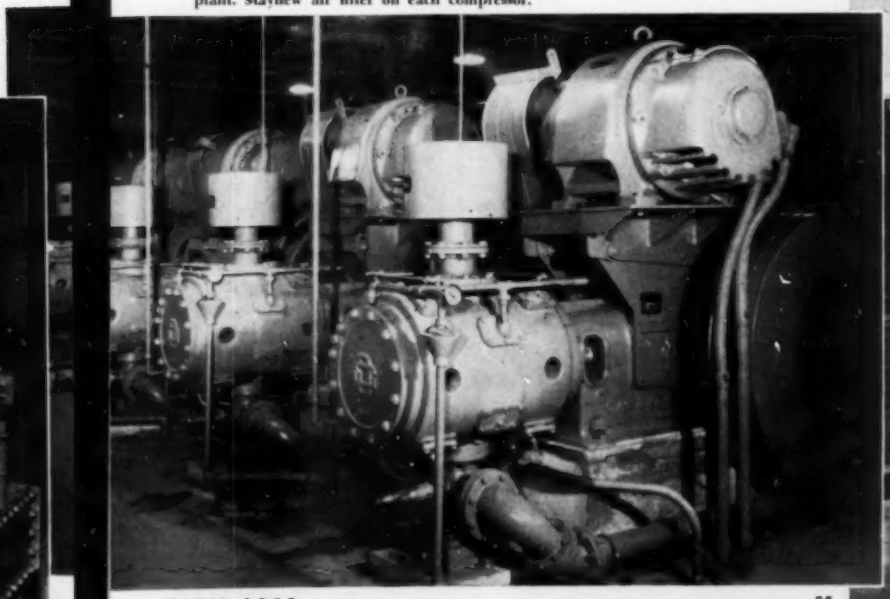
(2) G.E. 700 hp. motors.

(1) G.E. 450 hp. motor.

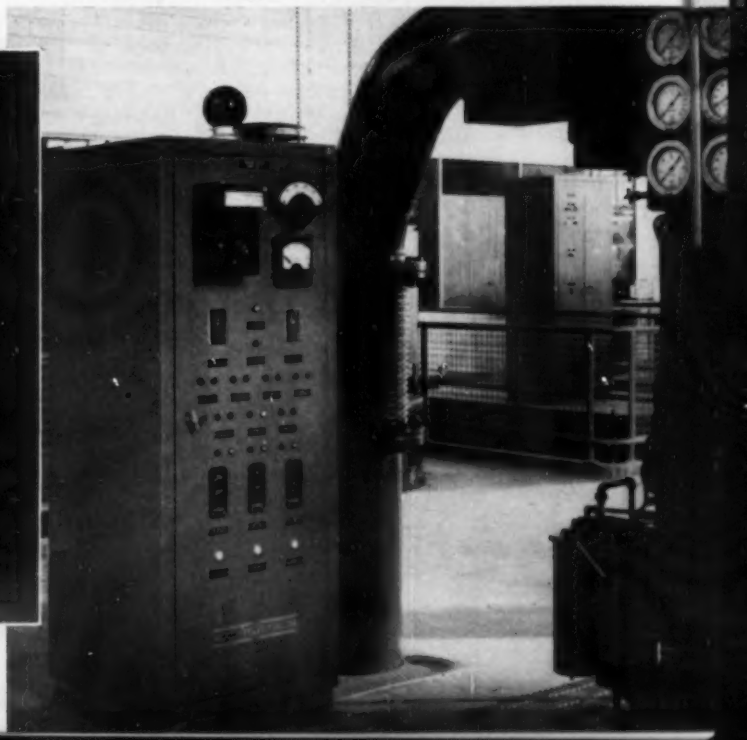
Switchboards. All G. E. equipment, built by Trumbull Electric.

Gould Batteries. 60 cells, M-G Charger. The Electric Products Company, Cleveland.

Four Gardner-Denver air compressors driven by 75 hp. Continental motors supplying "Motive Air" for the plant. Staynew air filter on each compressor.



One of the six automatic control cubicles with signal lights for all normal and abnormal conditions, Alnor pyrometer, Weston tachometer and G.E. ammeter.



# 50 YEARS LEARNING BY DOING

## Cal-Poly's 50th Anniversary Shows Visitors How It Cuts Building Costs and Speeds Plant Expansion by Teaching Boys to Operate and Service Heavy Equipment

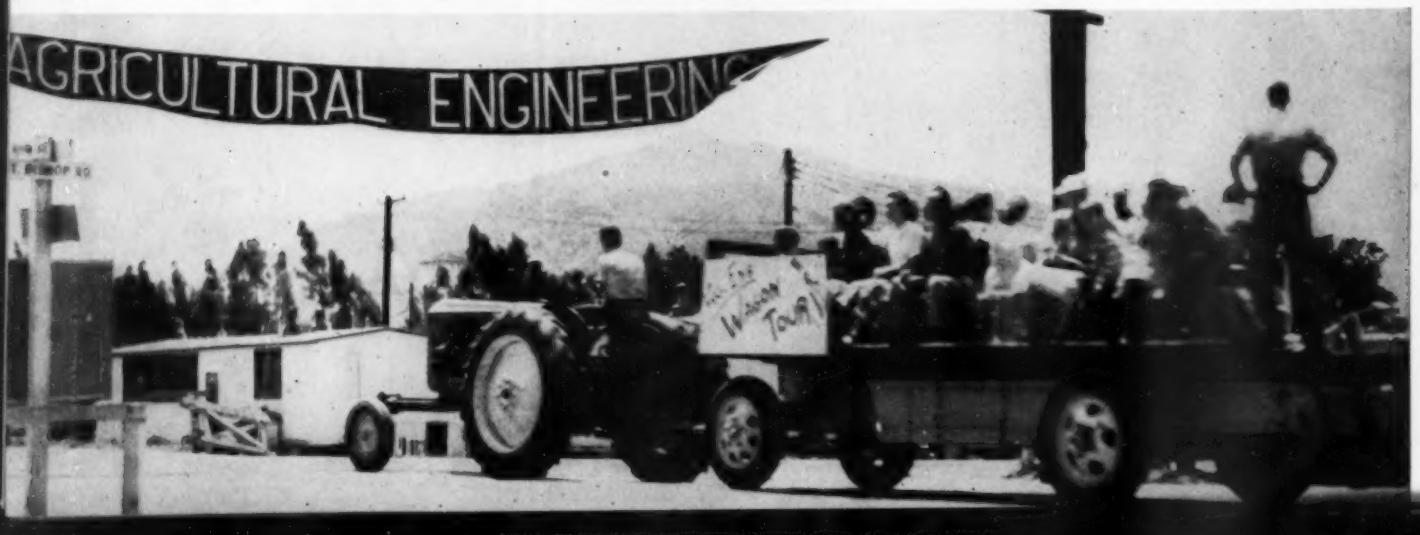
FARM and industrial tractor and equipment dealers and manufacturers gathered in large numbers at the 50th centennial celebration of California Polytechnical College at San Luis Obispo recently. Two years ago they saw the state dealers association cooperate in launching special courses at Cal-Poly. Lined up along the campus roadside in the outdoor exhibit, visitors saw a fleet of diesel dirt moving equipment that the students not only study in the service shops, but operate in the construction of new buildings, dams, roads, etc., as fast as the college grows. "These machines are actually worked by the students," said Jim Merson, tireless builder and promoter of his pet department that has accumulated this heavy dirt moving equipment for his students to learn by doing things the diesel way. "We have $50,000 in diesel equipment for our students here. Look at this list that we have leased.

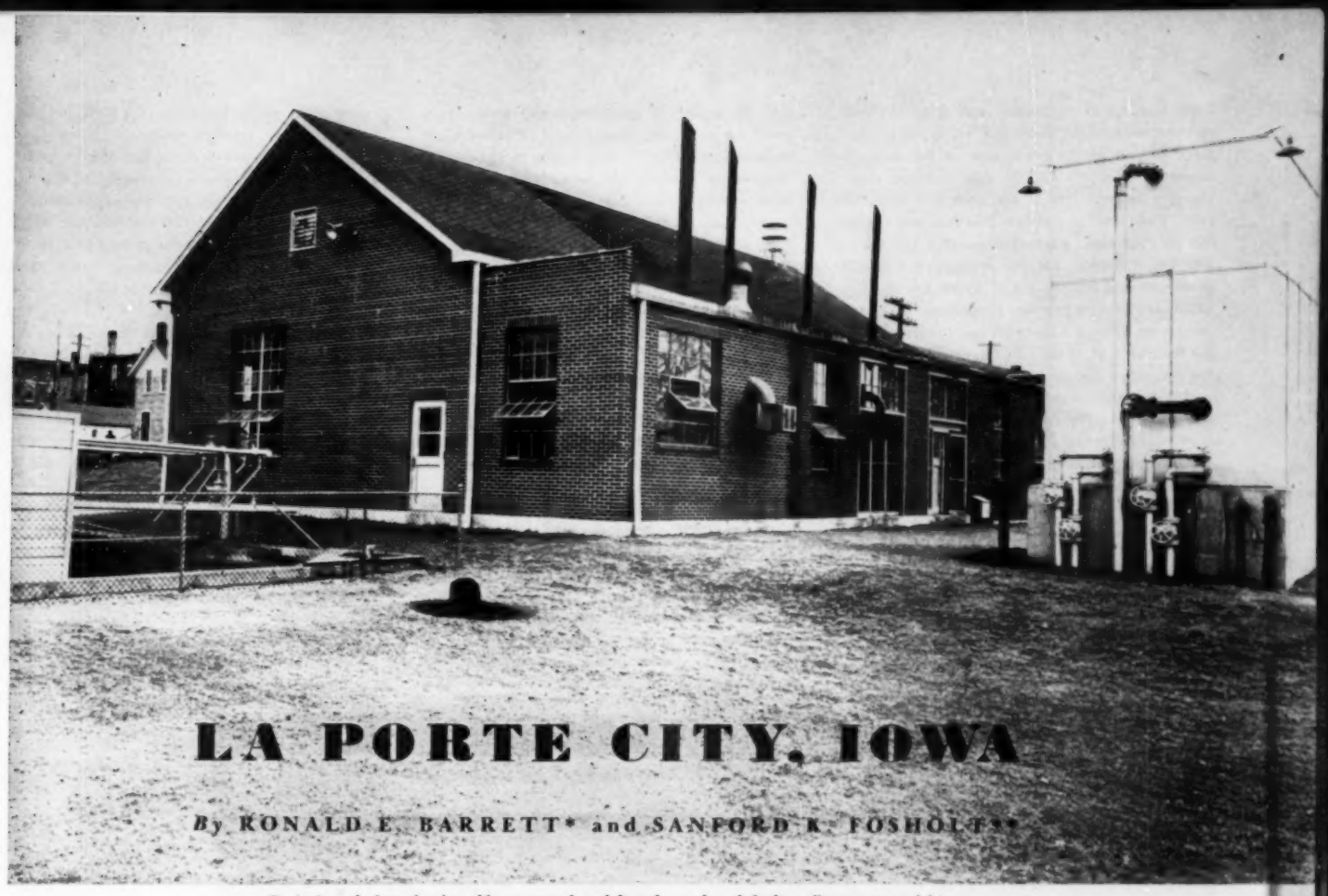
"The California State Polytechnic College has leased for instructional-study and work-purposes this equipment: John Deere Plow Company—two model B tractors, one model MC tractor, one model B202 two row cultivator, 116W automatic hay press, 1107 offset disc harrow, B-52 bedder, lister and planter, a number of Killefer solid engaging integral mounted tools; International Harvester Company—Model C. Farmall tractor, with 6 row cultivator attachment, TD6 diesel tractor, TD9 diesel tractor; Caterpillar Tractor Company--wide gauge D4 tractor with hydraulic tool bar; J. I. Case Company—VAC tractor, LD4622 disc harrow, EC 16W two way plow; Tractor Equipment Distributors, Inc.—Ford model 8N tractor with half tracks and under-drive transmission, blade terracer, heavy duty loader with manure and dirt bucket; Massey-Harris Company—44 diesel tractor; Fresno Agricultural Works—Gehl Forage Harvester; Be-Ge Company—LL10 Land Leveler, CP513 Carrypan.

"This lease system is something new recently worked out by us with the manufacturer to rent the tractors and machines we want to use on the farm by the students. Concentrating their exhibits in the ag engineering shops, department majors demonstrate the training that leads to two- or three-year certificates or the four-year bachelor of science degree. Included will be work done by students in agricultural mechanics, irrigation, farm carpentry, surveying, farm machinery, farm tractors, farm blacksmithing, parts and inventory control, farm power and advanced agricultural engineering, which includes major maintenance and repair of farm machinery and buildings, design of various structures, appraisal of used machinery and various phases of shop management.

Also on display was equipment made by the students, such as gates, watering devices, feeders, trailers and small buildings. In fact, many of the buildings actually seen in use and many of the roadways used in covering the huge campus, will be the product of "Merson's engineers," who recently capped their accomplishments by helping design and build a brand new reservoir system so Poly can supply itself with water during the mid-coastland's long dry summers. "This plan," Merson pointed out, "is as important to retail dealers as to our students. Not only can we keep our learn-by-doing program thoroughly up-to-date for every student who expects to engage in agriculture and its allied fields, but we can turn out potential employees familiar with the latest developments in products of the firms for which they will work and their competitors as well." The potential-employee angle is no assumed one, for Merson and his staff have graduates working the length and breadth of the Pacific region. In fact, graduates are placed as fast as they can be trained. Since most of the work is taught on the practical applied basis, the whole general farm area, 3,700 acres, serves as a laboratory for the great part of their activities. Other facilities include drafting, welding, machine shop, and hydraulics laboratories serving both the Agricultural Engineering Department and the Industrial Division.







# LA PORTE CITY, IOWA

By RONALD E. BARRETT* and SANFORD K. FOSHOLT**

Rear view of plant showing old spray pond on left and new forced draft cooling tower on right.

THE Town of LaPorte City, Iowa, like numerous other small Mid-Western communities, has experienced rapid increase of electrical loads since World War II, and in 1950 the latest addition to the municipal electric plant was placed in operation. This addition consisted of a 550 kw. Worthington diesel generating unit with the necessary auxiliaries. LaPorte City, which is a progressive community of 1,770 people, is located in an agricultural area of Iowa approximately 14 miles southeast of the industrial center of Waterloo. This location, which is also on the direct route of U. S. Highway 218, gives to LaPorte City the progressive influence not only of an active agricultural area but also of a rapidly growing industrial center nearby.

Municipal power plants in many Iowa towns are as much a part of the town as the village green and this certainly applies to LaPorte City which has a very successful dieselized plant now consisting of four engines and totaling 1,246 kilowatts in capacity. This municipal electric system had its beginning in 1935 when a bond issue of $98,000 financed the construction of the original plant (two Worthington diesel generating units of 150 kw. and 200 kw.), together with the acquisition of the existing electrical distribution system in the town. With the construction of the new plant, electric rates were reduced approximately 10% in the belief that such rate reduction would bring rapid increase in consumption of energy. By 1939, loads had approximately doubled and a new bond issue of $28,000 together with funds then on hand financed a third diesel generating unit of 346 kw. capacity with increased service facilities in the plant to aid in its operation.

During the years of World War II peak demand on the plant actually decreased but at the same time total generation increased nearly 30% in the five year period from 1939 to 1944 due to a considerable improvement in load factor. The increase in consumption again permitted the rapid retirement of bonds so that by 1946 all indebtedness on the original plant and the 1939 extension had been retired. From 1944 to 1949, loads again doubled in a five year period and this increase led to the installation in 1950 of the fourth diesel generating unit.

The municipal electric system is under the management of a three man Board of Trustees who establish the policies, and who, through the Town's Superintendent of Utilities, Mr. Don R. Olson, supervise the operation of the system. Credit is due these men for the efficient operation of this plant. Engineering of the original system and the extensions, including preliminary studies, design, and supervision of construction, has been performed by the Stanley Engineering Company of Muscatine, Iowa who have also performed the engineering services in connection with the LaPorte City sewer system and water system. Since inception of the municipal plant, the management and their consulting engineers have given special attention to the factors that would hold down costs and that would maintain good service. In the original plant, the required investment was held to a minimum by minimizing construction for future loads thus avoiding fixed charges on investment not yet needed. This permitted the initial reduction in rates which resulted in greatly increased consumption with attendant rapid rise in revenue and early retirement of indebtedness. The increased loads, while requiring installation of additional plant capacity, also permitted financing the additional capacity with comparative ease.

With the original plant, building space for auxiliaries and for storage were held to a minimum. A spray type cooling pond was provided. With the first extension to the plant, the space originally provided for the third generating unit became occupied, and new floor space for auxiliaries, for storage, and for housing the utilities maintenance truck, were added at that time. When Unit No. 4 was installed in 1950, the construction included a main building extension for the generating unit, an extension of the bay for auxiliary equipment, and installation of a forced draft cooling tower.

Upon comprehensive studies of past and probable future load growths together with analysis of economical unit size, the Stanley Engineering Company prepared design, plans, and specifications for the 1950 plant extension. This extension embodies

*Mechanical Engineer
**Chief Engineer, Stanley Engineering Co.

latest features of equipment and design with an eye to economy and dependability. While the first three engines in the plant were of the naturally aspirated type, the fourth unit included supercharging for economy of operation as well as first cost. This unit is another Worthington engine, 790 hp., 360 rpm., 6-cylinder, model, SDD6 with a 550 kw., 2400-volt Electric Machinery Company generator and with a chain driven exciter. The plant arrangement provides for drawing the engine intake air through a shielded and louvered intake on the west side of the building with the air passing through a viscous impingement type filter and and air intake silencer on its way to the supercharger intake. The engine exhaust passes from the water-cooled manifold through the supercharger then through a corrugated expansion joint to the side inlet exhaust silencer located in the building chamber provided for that purpose and then out through the exhaust stack through the roof. The heat trapped in the exhaust silencer chamber can be circulated to the engine room by means of a fan to provide waste heat recovery for the power plant heating.

The new forced draft cooling tower has a capacity of 2,500,000 btu. per hour and is equipped with a winter bypass of spray water and with a two-speed fan to permit closer control of jacket water temperatures. This cooling tower, with the accompanying spray water pump and two jacket water pumps, is interconnected with the original spray pond and its heat exchangers and pumps to allow maximum flexibility and to permit standby cooling capacity when the tower or the pond is out of service for cleaning. Both jacket and spray water makeup are provided from a zeolite softner and the spray water is further treated with Calgon.

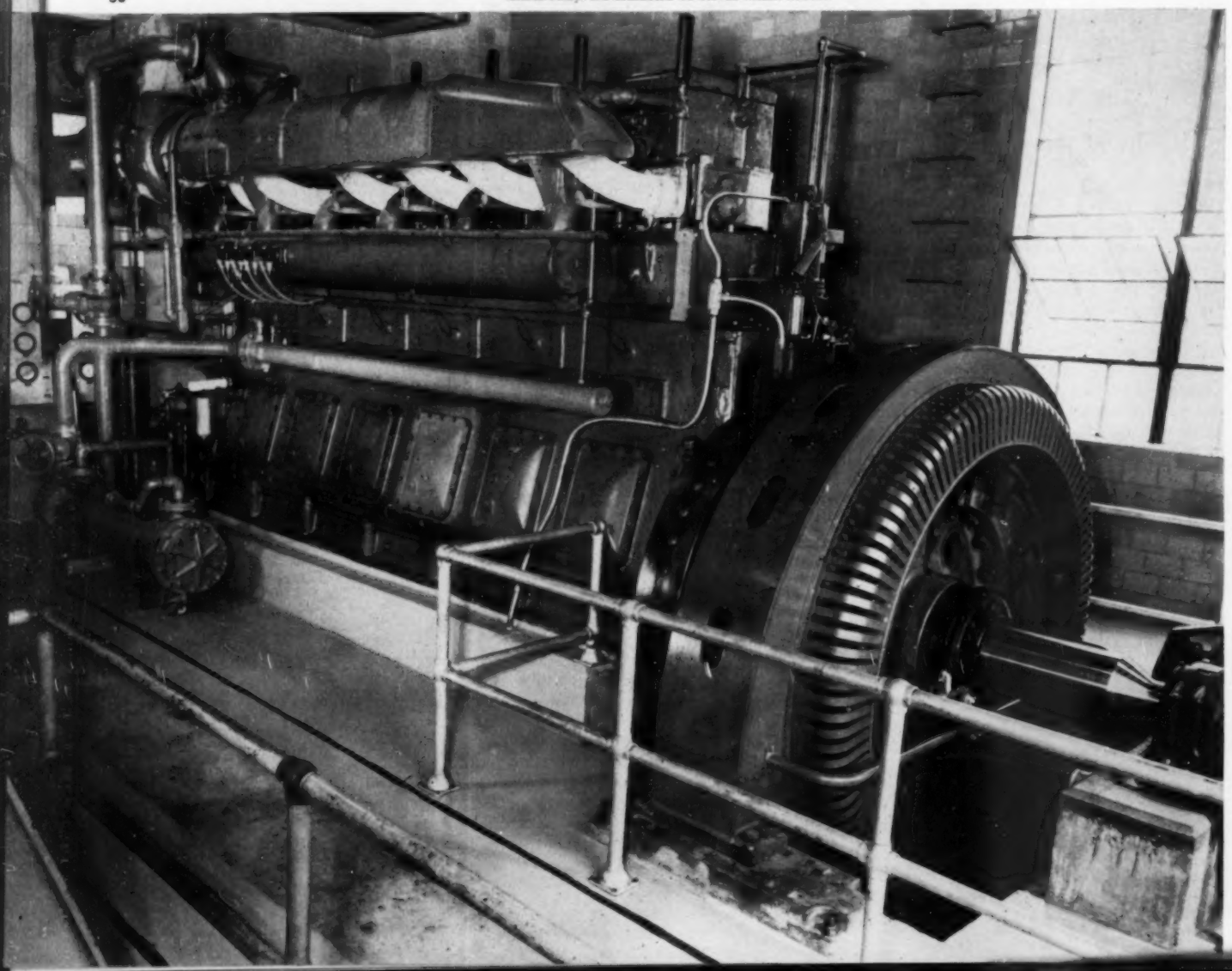
Engine lubrication involves the use of straight mineral oil with Fuller's Earth filters and with a Diesel Service Company oil conditioner for maintaining clean oil. The lubricating oil is circulated continuously through the Fuller's Earth filter cartridges, during operation of the engine, by bleeding a part of the engine-driven circulating pump discharge through a regulating orifice to the small filter line. An electric motor driven "Before-and-After" lubricating oil pump is installed with an automatic pressure control in the discharge line from the engine pump. Thus, this pump can be for circulating oil before starting the unit, after stopping the unit, and in an emergency for a short period on faiure of the normal pump. The lubricating oil is cooled by means of a shell and tube heat exchanger through which the jacket water is circulated before it enters the engine jacket. Fuel oil is stored near the railroad siding approximately five blocks from the power plant and is pumped to the fuel oil day tanks in the power plant from which it flows by gravity to each engine. Fuel oil filtering equipment has recently been added to permit use of crude oil.

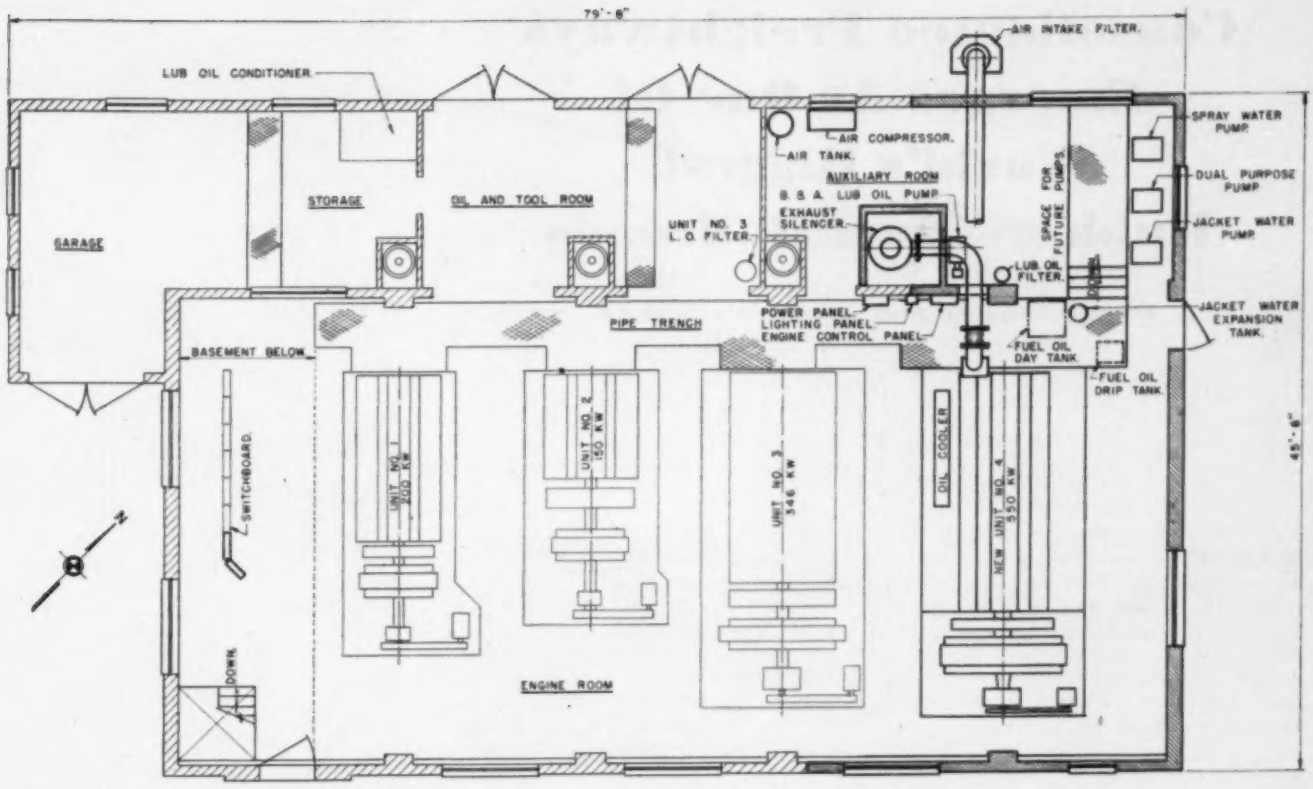
Compressed air starting is provided for all engines in the plant.. The system operates a 250 psig and includes two air tanks and a dual drive compressor in the basement, provided with the initial unit, as well as a new storage tank and a two-cylinder, air-cooled, direct-drive compressor, installed with the newest engine. The switchboard provided in the original plant consisted of a conventional dead-front, open-type switchboard at operating floor level, together with bell crank operated oil circuit breakers and 2400 volt bus structure mounted on a platform above the switchboard to conserve space. This switchboard and bus structure was found satisfactory for extension to accommodate the new unit.

An engine operating control panel is provided

**New 550 kw., Worthington SDD-6. Note engine control panel mounted on wall in front of engine and lube oil heat exchanger mounted along side of engine on foundation. Alarm relays are bracketed off the air intake header.**







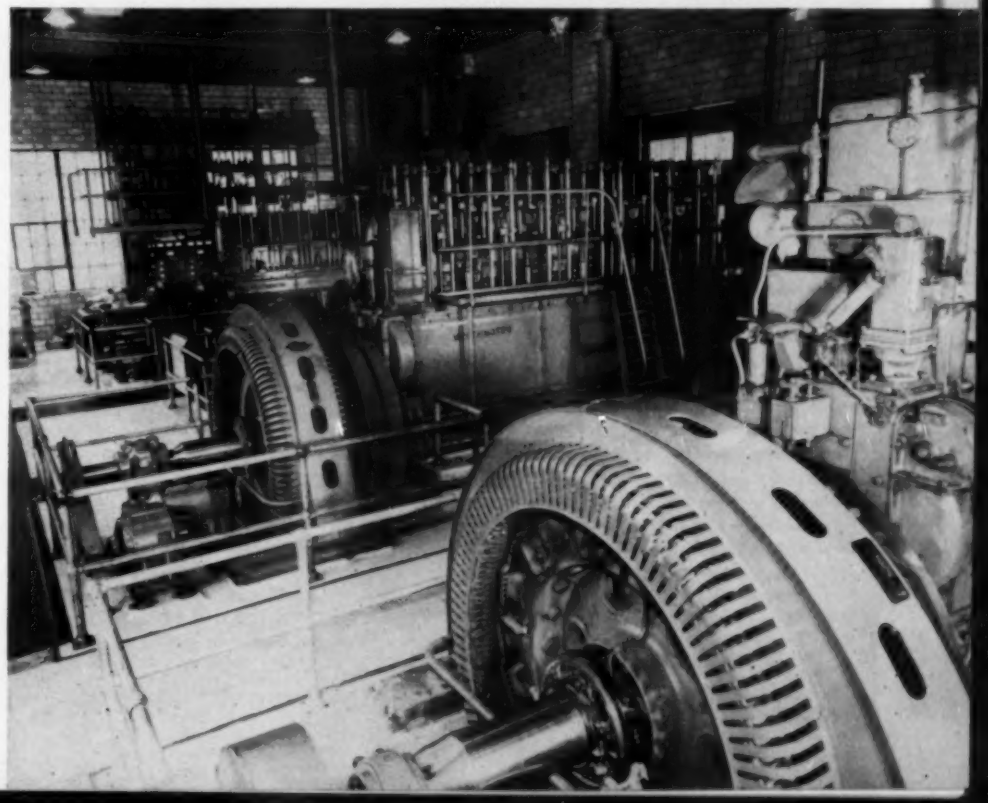

with the new engine and centralizes controls for engine auxiliaries while providing a convenient location for the necessary gages and the alarm system. Alarms are provided for high jacket water temperature, low jacket water pressure, high lubricating oil temperature, low lubricating oil pressure and high fuel oil drip tank level.

Prior to 1950 the average gross generation in the plant was approximately 12 kwh. per gallon of diesel fuel oil. The newest unit has performed at approximately 13 kwh. per gallon of fuel oil and, with the recent addition of facilities for burning crude oil, this has been improved to well over 13 kwh. per gallon at all loads. With the change to burning of crude oil the cost of fuel was reduced from about 11.7c per gallon to less than 10c per gallon thus resulting in a fuel cost savings of more than 1 mill per kwh. Although natural gas is not now available in Laporte City, the new engine is arranged to permit future conversion to dual fuel operation should natural gas become available, or should liquefied petroleum gas become attractive as a fuel for the plant. The people of Laporte City, Iowa are proud of their municipal electric plant, and they may well be, because their plant has a nice record of economy and service.

## List of Equipment

Engine—790 hp., 4-cycle, mechanical injection, 6-cylinder, 13¼-in. bore, 17½-in. stroke, 360 rpm., supercharged diesel engine, Model SDD-6. Worthington Pump and Machinery Corp.
Generator and Exciter—Electric Machinery Manufacturing Company.
Turbo-Charger—Elliott Company.
Fuel Injection Pumps—American Bosch Corp.
Governor—Woodward Governor Company.
Lube Oil Cooler—Ross Heater & Mfg. Co.
Cooling Tower—Diesel Service Company.
Water Pumps—Worthington.
Lube Oil Filter—U. S. Hoffman.
Air Intake Filter—American Air Filter.
Air Intake Silencer—Air-Maze Corp.
Exhaust Silencer—Maxim Silencer Company.
Building Work—Jens Olesen & Sons Construction Co., Waterloo, Iowa.
Electrical Work — E. A. Pedersen Company, Omaha, Nebraska.

**Engine room view with new 550 kw. generator in foreground and switchboard at far end. The bus structure is mounted on a platform above the switchboard, and fuel oil day tanks for the three smaller units are bracketed off the wall to the right of the switchgear.**



# Consolidated Freightways Emerges As One Of World's Biggest Rubber-Tired Railroads

## West's Biggest and America's Second Largely Run by Diesels

*By* CHAS. F. A. MANN

IMAGINE a diesel trucking operation with a "mainline mileage," including alternate routes, larger than any American railroad and second only to the two giant Canadian systems, that grew up in 22 years from a small regional trucking company hauling a mere 48,000 tons of freight in a whole year to a giant merchandise carrier handling over 900,000 tons last year.

Consolidated Freightways of Portland, Ore. has become one of the leading motor freight concerns in the nation, ranking second nationally and first in common carrier freight hauling west of the Mississippi River. To keep pace and grow with the far-flung territory served, that sprawls from a heavy-haul network in Oregon, eastern and central Washington, San Francisco Bay area and on back to the Wisconsin and Chicago region, Consolidated has not only led the procession of all large trucking firms in mechanical ingenuity, but it has delved into operating economics and practices on a scale not reached by many of our leading century-old railroads.

Approaching their huge operations from the point of view of mass-producing highway transport, rather than merely visualizing their operations as a series of expanding local operations connected up like a chain of small links, the company has gone deeply into every assembly-line practice that will increase efficiency of handling cargo, maintaining and building equipment and getting the maximum output of manpower and machinery to the point where the whole system runs as an integrated whole, like smooth clockwork.

Consolidated has given a great lift to the independent diesel engine industry by deliberately working constantly with three diesel engine builders—Hercules, Cummins and Buda, toward the goal of a perfect diesel for heavy trucking use. At various times each of these engine builders have counted their total roster as biggest in the Consolidated fleet. Right now it is Buda that is on top. By approaching their operations as a complete, large unit, the company has been able to gear its official thinking, its purchasing, its equipment design and its maintenance routines up to the highest level of U. S. mass production thinking ever known in automotive transportation.

All the tricks of materials-handling in large industry have been adapted to freight handling at Consolidated's terminals, right down to the merry-go-round truck circle loading and unloading system. All the tricks of assembly-line automotive production have been adopted outright or modified in the elaborate, high-speed maintenance routines that take a dirty truck just in from Chicago 2400 miles away, wash, lubricate, check every piece of diesel and accessory equipment, change tires and give a complete safety inspection in a matter of hours, using extensive parts and unit changeout methods, and get it back on the loading dock by evening for a return trip to Minneapolis or San Francisco! Assembly-line methods in the manufacturing subsidiary, freightliner Corp., put the big new trucks, trailers and semi-trailers together with precision and speed of peeling a pear in a cannery. Factory built methods dismember a diesel or a transmission and rebuild it to new diesel guarantee standards in approximately the same time it takes to put a brand new diesel together at the original factory.

Punch-card accounting; a nation-wide telephone and teletype printer hookup to every major terminal and constant laboratory research into everything that goes into motor transport, from legal and tariff problems; rate structures; finance, weight and dimension restrictions; and general economics of highway freight hauling and on into the life of various kinds of muffler metals; radiator cores; injection valves and various formulas for tire recapping—all are part of the Consolidated's mass-production of highway transport. Like all good things, the home town knows less about Consolidated than the boys in Chicago, San Francisco or Denver do!

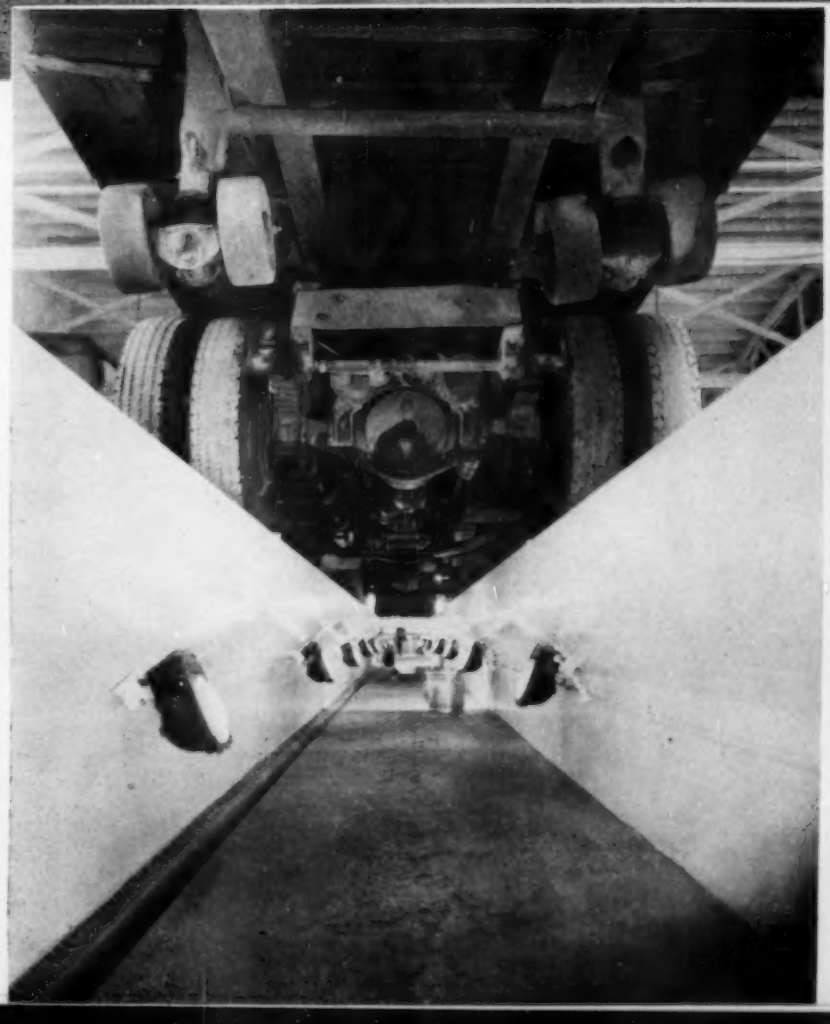
Total road mileage for 1951 exceeded 44,000,000 miles. Its longest haul is 2514 miles and from an average haul in 1945 of 470 miles its current average is better than 625. Its gross for 1951 exceeded $28,000,000. Portland alone, its home office, has over 700 employees, and all its management,

"West End" type short wheelbase full truck and trailer, which is standard west of No. Dakota line.

maintenance and manufacturing operations center there. Freightliner Corp. its nextdoor subsidiary which has developed the cab-over-engine, maximum-width and height and minimum length truck and trailer units, last year made a deal with White Motors to manufacture the White-Freightliner truck line, to sell to anybody, and the Freightliner designs already have attained the heights of ingenuity, maximum weight reduction (with consequent increase in freight capacity within highway weight limits, and have pioncered the extensive use of aluminum alloys for everything except main diesel engine parts, main chassis frames and certain shafts and gears and housings, to the point where two tons of deadweight per single Freightliner are saved by the use of aluminum parts—radiator shells, tanks, connecting parts, body metal and even fenders. Douglas fir plywood is the rest of the strong-but-light technique—in liberal quantities of the waterproof type.

Main terminals of the company cover all the important cities of Washington, Portland and Eugene, Oregon; Oakland and San Francisco; and at Boise, Salt Lake, Great Falls, Billings, Butte, Minneapolis and Chicago. Despite the fact that over 150,000 single shipments per month are carried by Consolidated's giant fleet no single customer nor a single commodity accounts for

**Floodlighted inspection pit at Portland shops.**



more than 5% of its total revenues. West of North Dakota, diesel trucks and full trailers are operated with total length of 60 feet. East of there, tractors and 45-ft. semi-trailers are operated. Some rail freight moves from Chicago to Marmarth, N. D. where it is transferred to trucks for distribution in the West.

As to operations, outside the 36 terminal city warehouses (including the main company terminals listed above), the central dispatch office in Portland, controls traffic over the entire system. The constant pounding to keep the load factor high, by means of fast dispatching and deft freight solicitation, resulted in 1950 a load factor of 68% for the total revenue truck miles operated. The major maintenance shop at Portland controls the policy for the whole system, with a smaller general shop in Chicago for the different type of equipment used on the east end of the system. Service shops for running inspections, tire changes and emergency mechanical work are located at Seattle, Spokane, Oakland, Boise and Minneapolis. Its far-flung, far reaching preventative maintenance system is the cynosure of all eyes in the motor transport industry, not only in North America but throughout the world. Its general maintenance Supt., E. B. Ogden of Portland, is the No. 1 recognized authority in his en-

tire field. Nothing seems too good for Consolidated!

The fleet of equipment run by the company—the last grand total listed as of July 31, 1951, is as follows:

| | |
|---|---|
| Intercity trucks | 294 |
| Intercity tractors | 137 |
| Intercity full trailers | 487 |
| Intercity semi-trailers | 213 |
| City pickups | 584 |
| City pickup tractors | 67 |
| City pickup semi-trailers | 40 |
| Passenger and service cars | 188 |
| Grand Total | 2010 |

All road trucks and tractors are dieselized and the most of the city pickup trucks are gasoline powered. As previously mentioned the diesel roster includes the 150 hp. H. B. Cummins, which will probably be replaced gradually with the higher powered H. R. Cummins of 225 hp. or the large 280 hp. Budas. Then there are the DFX Hercules diesels of 240 hp. and Cummins of 225 hp. and the large Buda DAS 6 models of 844 cu. in. displacement and developing 280 hp. at top speed. All are worked into whatever basic type of road unit they seem best fitted for—the higher powered diesels used largely in the mountainous West and the lighter units in the flatter Midwest territory. All fleet units are divided into 9 operating zones for licensing and tax purposes to enable the minimum accounting and exchange licensing arrangements. The number of trucks grouped into each region is large enough to handle peak loads, with possible extra units licensed in additional states.

The progressive preventative maintenance system is fined down to extremely scientific procedures, right into the accounting and dispatching of shop and maintenance routines by a shop dispatcher. A typical 5 month period last year showed a road-haul mileage with diesels for the high expense month of November of 2,872,000 miles at a maintenance cost of 11.43 cents per mile, and the low month of August with 3,273,000 miles operated at a maintenance cost of 8.895 per mile. The whole five month period worked out for the system at 10.128 cents per mile and a fuel cost almost reversing the time on the maintenance—a high in July of 4.28 cents per mile for the fleet and a low in October of 2.61 cents per mile. Drivers average between 9½ and 10½ cents per truck mile.

More than 11,000 tires constantly roll in the big road fleet. At Portand they are recapped and rebuilt on the average of 2.2 recaps per tire before the carcasses give out. New tires cost about $100 each, so the recapping cycles pay off handsomely. And flat tires on the road on Consoidated are Bostonian—they simply don't happen in a well-run outfit!

In considering maintenance and repair costs, a three month's summer period reveals the cost on the four classes of diesel equipment as follows: —Western equipment; full trucks, 9.48 cents per mile; tractors, 8.99 cents per mile. Heavy hauling; full trucks, 9.46 cents per mile; tractors, 9.08 cents per mile. Eastern Equipment: tractors, 9.06 cents per mile. Moving vans; tractors, 8.42 cents per mile.

On the transportation account, which incudes drivers' wages, fuel and lube, fuel and lube taxes, licenses and fees, insurance, miscellaneous transportation expense and supervision, the breakdown is as follows in cents per mile:

| | |
|---|---|
| Western full trucks | 18.28 |
| Western tractors | 17.18 |
| Heavy haul (trucks) | 19.57 |
| Tractors, heavy haul | 18.53 |
| Eastern tractors | 15.91 |
| Moving vans | 16.96 |

Added to the above in the categories of depreciation, general and administrative overhead averaging about 4¼ cents per truck mile, the grand totals of all costs equated on a per truck mile basis (in cents) is as follows:

| | |
|---|---|
| Western full trucks | 36.25 |
| Western tractors | 34.64 |
| Heavy hauling trucks | 39.69 |
| Heavy hauling tractors | 36.25 |
| Eastern tractors | 31.02 |
| Moving vans | 38.90 |

During winter storms in the west and cold snaps in the East, these figures rise slightly. In periods of maximum load factor or utilization of the entire fleet, these figures may drop slighty in some categories or rise in others. A system of tight check-up, broken down into glaring "reasons why" is run on all scheduled truck operations and the reports circulated throughout all departments of the company. Thus if a laggard driver, a sleepy coordinator, a shiftless billing clerk, an absent minded freight dock worker or the shop fell behind, the whole organization knows who, when and how much time was irretrievably lost. From 70 to 90 percent scheduled performance is the rule at Consolidated or some departments start looking for another boy!

In one week, for example, 185 schedules were set, 152 of which were men on the advertised just like railroading. A daily time record, kept in minutes, of the total delay is run off on a weekly basis showing actual minutes charged to each department by way of lost time. Morale is high at Consolidated and seems to be getting higher. An interesting diesel statistic was run off on all diesel energy used with some interesting results. See table 1. The large group of new Buda DAS diesels of 280 hp. did not figure in these records.

There are countless stories in Consolidated's con-



Rolling a Buda super-diesel into a freightliner, note the trick dolly.

New Budas, Hercules and Cummins diesels for Consolidated's giant fleet of freightliners.

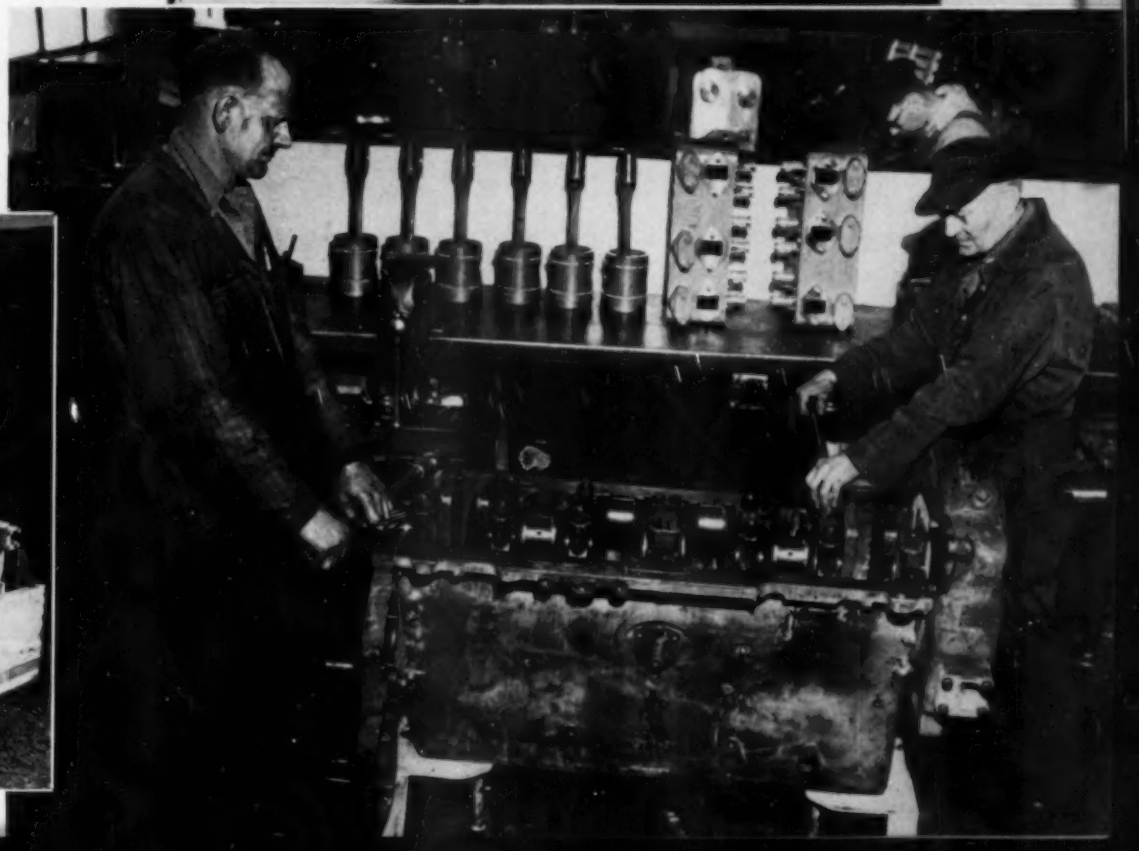
tribution to the motor freight industry. . . such as Les Heywood's unique shop training program with one hour of classroom per week and numerous mechanical and freight handling innovations not dreamed up by other companies, and their extensive cooperative research program going on continuously with equipment manufacturers. Those statistics will have to wait.

Officers of the company include a man long pioneering in Consolidated, board chairman E. W. A. Peake, the far-seeing 82 year old financier of Hollywood, California. President is Leland S. James, one of the founders and a Portlander. J. L. S. Snead, executive vice president; L. E. Kassebaum, vice president; L. F. McCroskey, treasurer; O. C. Bennett, secretary; Max R. Jensen, superintendent of transportation; Jack Howay, superintendent of terminals; E. B. Ogden, superintendent of maintenance; Joe Lovretich, superintendent of Portland and shops and Clarence Gaughen, superintendent of Chicago shops.

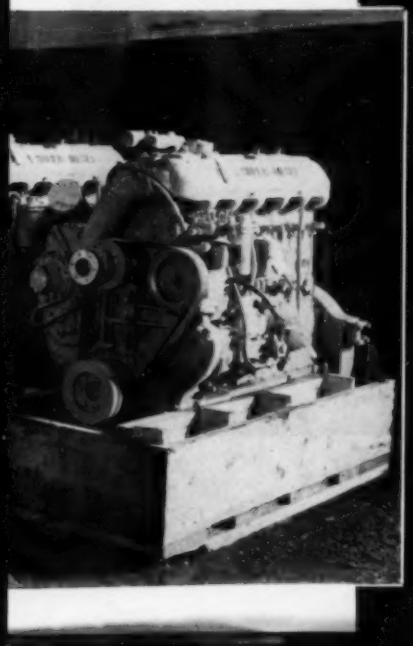
**TABLE I**

| Engine | Miles Run | Fuel Used | Miles per Gallon |
|---|---|---|---|
| Buda DAS, 280 hp. (38 units) | 864,015 | 208,674 | 4.14 |
| Buda DAS, 275 hp. (13 units. Rebuilt) | 336,845 | 82,391 | 4.09 |
| Hercules DFXH (68 units) | 1,911,746 | 443,236 | 4.31 |
| Cummins HRS, 225 hp. (32 units) | 814,973 | 178,981 | 4.55 |
| Cummins HR-165 (76) Eastern Div. | 1,009,330 | 188,502 | 5.28 |

**Well equipped, well lighted clean under-pits make maintenance efficient at Portland shops.**



**Typifying the costly manner in which Consolidated Freightways tear their diesel engines down on a regular maintenance schedule.**



# WSYR - TV STATION

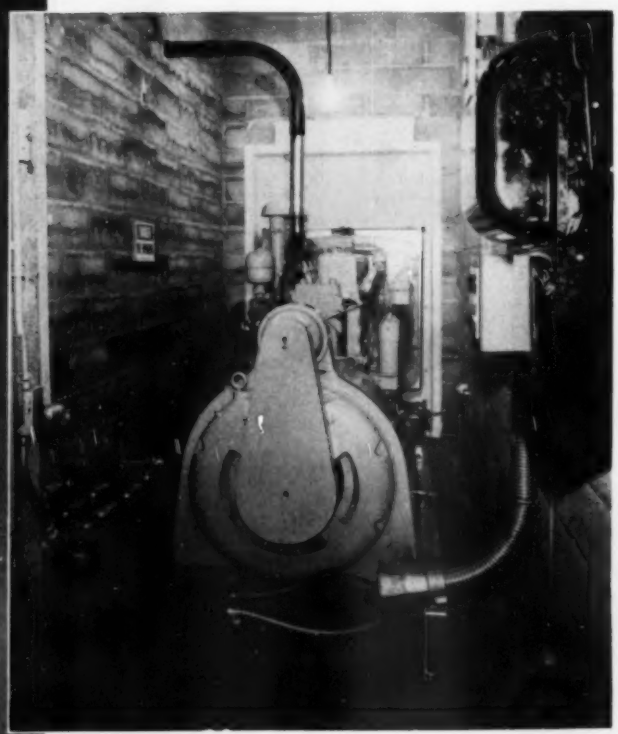
A violent windstorm with gusts up to 90 mph. lashed Central New York State on Saturday November 25, 1950. An official of the Niagara Mohawk Power Company reported it was "one of the worst storms in years." The New York Telephone Company said 4,700 phones were out of order as of 9:15 p.m. in Syracuse and 40 county communities. The hurricane winds caused the death of 6 people and inestimable property damage, leaving many parts of the City of Syracuse without lights or power for as long as 5 days.

Television Station WSYR was forced to discontinue televising Saturday at 1:30 p.m. and was unable to resume normal operations until Monday noon. Mr. Armand Belle Isle, WSYR's Chief Engineer immediately initiated action for the purchase of a self-contained emergency generator set. Having previously spoken with Sales Engineer W. E. Forsthoff of the Syracuse Supply Company—Caterpillar dealer for Central and Western New York State—concerning Caterpillar diesel engines, Mr. Belle Isle now was in a buying mood. A careful survey of WSYR's power requirements was made and the Caterpillar D-13,000 120/208, 83 kw. diesel engine generator unit was selected as the power unit best suited to supply WSYR's emergency power needs. WSYR purchased this unit in January, 1951.

WSYR Television Transmitter Station on Sentinel Heights, has a commanding location overlooking the Onondaga Valley and the City of Syracuse. This site was chosen by WSYR's Chief Engineer Armand Belle Isle as the most ideal place for maximum transmitting range in the Syracuse area. This television transmitter station incorporates the most modern equipment and latest engineering features available for television transmission. A fully automatic, thermostatically controlled air ventilation system, utilizes the heat emitted by the transmitter tubes for heating the building while simultaneously providing adequate cooling for the equipment.

An aluminum louvre, normally closed, automatically opens by the forced air draft of the radiator fan when the engine is operating. This "Blower type fan" simultaneously creates a temporary partial vacuum in the generator room which acts to open a rear "pressure release" door. This system provides sufficient cooling for both generator and engine and fully ventilates the generator room. Because of its immediate availability a channel mounted D-13,000 generator set was used for this installation. Sufficient tests proved the vibrations of this Caterpillar diesel engine-generator arrangement were negligible. Consequently, no vibration isolation dampening mountings were utilized, even though the generator room is only separated from the transmitter equipment by a small ventilating control room. This unit has further use then merely serving as an emergency plant for power failure. Severe lightning storms, particularly during the summer months, produce excessively high voltage variations of the main power supply. Since these whims of nature have no effect on the dependable diesel operation, the Caterpillar unit operates during those electric storms. Its closely regulated output voltage permits steady, good transmission without worry to the station personnel. Francis Thisse, WSYR's Transmitter Superintendent, supervised the electrical installation. His interest and thoroughness, along with some original ideas for ingenious hookups, helped make WSYR's fully automatic Caterpillar diesel generator plant, the ideal "worry free" emergency power supply installation.

This electric set is equipped with a fully automatic, 32 volt electric starting system. An "Eseco" automatic transfer panel energizes the engine starting system when the main power fails. Within 4 seconds the emergency generator is set up to rated voltage, and the load automatically transferred to the diesel plant. When normal power is restored, the switch shifts the load back to regular power and stops the diesel engine. A G.E. automatic battery trickle charger operating on 110 volts ac. maintains the 5—Willard-RHD-39-3 starting batteries fully charged at all times. A diesel engine mounted gasoline starting engine is further assurance and guarantee of positive starting. This feature makes the emergency plant independent of the batteries or any external starting aids.



# For proven dependability...

# AUTO-LITE

## diesel equipment

For over 41 years Auto-Lite has been building complete electrical systems for the makers of many of America's finest cars, trucks and tractors. It is this experience that makes possible the outstanding dependability achieved in Auto-Lite Diesel Equipment —from generators to voltage controls—from batteries to starters. This unfailing reliability in service has helped to make Auto-Lite the world's largest independent manufacturer of automotive electrical equipment. If you have a particular diesel problem, Auto-Lite invites you to write to

Toledo 1, Ohio **THE ELECTRIC AUTO-LITE COMPANY** Sarnia, Ontario

Tune in "SUSPENSE!" . . .
CBS Radio Mondays . . . CBS Television Tuesdays

# WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

**Hamish Ferguson was appointed secretary to the Diesel Engine Users Association in London in 1944. Previously senior technical assistant to Diesel and Insurance Consultants, London, and for several years with English Electric Company in the designing and erection of large diesel generating plants. Mr. Ferguson continues to do independent consulting work.**

THE gas turbine has made steady progress in England during the past year, and though there are as yet comparatively few in service operation this is due to a wise reluctance on the part of the manufacturers to market their machines until the prototypes have been fully approved. Furthermore, varying applications call for different types of fuels, and this again calls for additional research and development work.

The writer is indebted to "Gas and Oil Power" for permission to quote from the table showing the various projects in hand and the state of development of the individual units included. The list is not fully comprehensive since there are further projects under way which are still unannounced. In all there are some 30 different types, of outputs varying from the small Rover 100 hp. automotive unit up to 15,000 and 20,000 kw. sets being built by English Electric, Parsons and Metropolitan Vickers. It should be noted, however, that there are nearly 20 types of the intermediate power output range which could compete with diesels in current production. It will be interesting to see how the respective running and maintenance costs compare on a basis of similar duties, for it seems likely that the capital costs for gas turbines will be appreciably lower than for diesels.

Outside the aircraft field, the applications receiving attention are: *Industrial*. These units vary in output from 700 kw. to 15,000 kw. and are generally to be installed for peak-load operation in conjunction with the Grid system. Several of these are either under construction or now being installed.

*Marine*. The Admiralty has 6 types for ship propulsion either in service or under construction. The Anglo-Saxon Petroleum Co. has a 1,200 shp. unit with electric drive in their tanker *Auris* and this ship has now completed her second trans-Atlantic voyage showing satisfactory results from the gas turbine.

*Locomotive*. Only one home-designed unit has so far been supplied for use on the British Railways —this is a 3,500 hp. turbine built by Metropolitan-Vickers, and after preliminary trial running it is now being prepared for main-line service.

*Automotive*. Development of the small Rover unit of 100 to 200 hp. has been continuing though it is not yet on the market. The Royal Automobile Club has now arrived at a formula for power rating which should enable the gas turbine car to compete in international racing alongside cars of more orthodox type. Their performance may well have a considerable bearing on future developments in this field.

| Maker. | User or potential user. | Power. | Reported stage of development | Remarks. |
|---|---|---|---|---|
| Allen | Admiralty | 1,000 kW | Under test | |
| B.T.H. | Anglo-Saxon Petroleum Co. | 1,200 s.h.p. | In service in m.s. "Auris." | Electric drive |
| | Nairobi South Power Station, Kenya | 2 sets of 2,500 kW. | Under construction | Oerlikon compressors |
| John Brown | Dundee Power Station. | 12,500 kW. | Being erected on site | Escher-Wyss closed cycle |
| | Manufacturer for development work | 1,000 b.h.p. | Under construction | Primarily for closed cycle, coal burning experiments |
| | Foleshill (Coventry) gas works. | 700 kW | Under construction | Closed cycle. Heat from waste gas flue |
| | Manufacturer for development work | about 300 h.p. | Experimental running | Formerly open cycle, now closed cycle |
| Brush | Metropolitan Water Board, Ashford | 2,500 kW | Under construction | For stand-by use |
| English Electric | Admiralty for H.M.S. "Hotham" | 6,000 s.h.p. | Under test | |
| | Metropolitan Water Board, Ashford | 1,875 kW | Under test | For stand—by use |
| | Ministry of Fuel and Power | 2,000 kW | Under construction | Coal burning experiments |
| | Ministry of Fuel and Power | 2,000 kW | Under construction | Methane burning in coal mine up cast gas. |
| | Unspecified | 2 sets of 20,000 kW | Under construction | Peak load generation |
| Metropolitan-Vickers | Trafford Park, Manchester, B.E.A. | 15,000 kW | Being installed on site | |
| | Metropolitan Water Board, Ashford | 2,500 kW | Under construction | |
| | Admiralty for two new convertible M.T.B/M. G.B.'s | 4,500 h.p. | Being installed | Two per Vessel |
| | Admiralty for M.T.B. 5559 | 2,500 s.h.p. | In service Third unit under Test | First unit in Science Museum Second unit in M.T.B. third unit at Admy. Expt. Estabt. |
| | British Railways, W. Region | 3,500 h.p. | Installed in Locomotive | |
| | Manufacturer | 2,000 kW | In service | |
| | Ministry of Fuel and Power | 2,000 kW | Under construction | For coal burning: two-stage combustion |
| | Shell Petroleum Co. Ltd. Maracaibo Oilfield | 1,750 kW | Under construction | |
| Pametrada | Pametrada | 3,500 s.h.p. | In operation at Wallsend | |
| | Pametrada | 2,000 h.p. | Under construction | A turbo-compressor set for combustion tests |

Same as M.W.B. sets except for combustion equipment

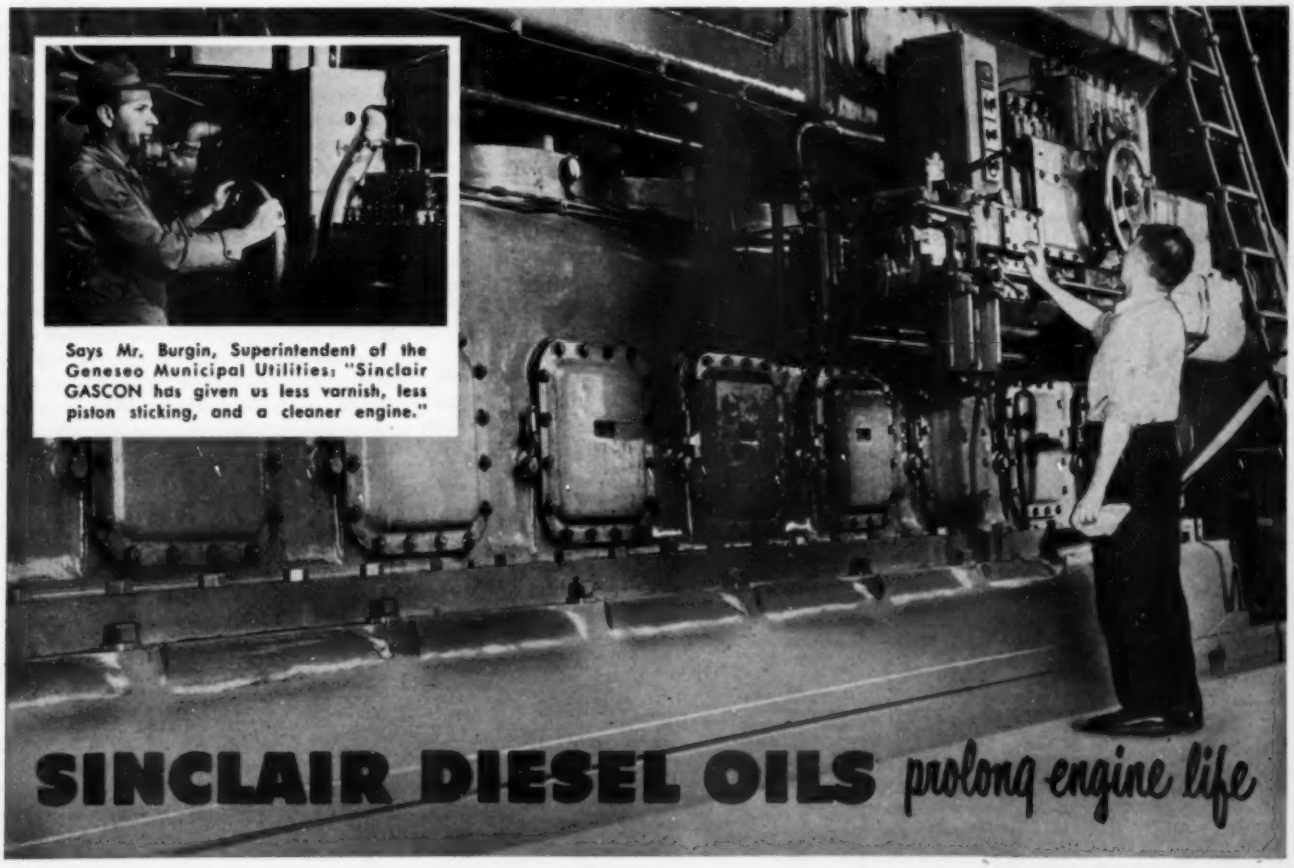
**The table above shows the state of a few of the gas turbine projects now going on in Great Britain. Not shown are those projects undertaken by C. A. Parsons, Rolls-Royce, Rover and Ruston & Hornsby.**

# Light Plant Solves Problems of Sticky-Rings and Carbon-Build Up

● For quite some time the Light Plant of Geneseo Municipal Utilities, Geneseo, Ill., had trouble with sticking rings, and with carbon deposits in the exhaust ports of its diesels. A few years ago these diesels were changed over to Sinclair *Gascon D*. Almost at once, it was noted that the troublesome conditions started to clear up. In the time since, sticking rings have become the rare exception and the carbon deposits are no longer a problem.

Furthermore, in 1947, a 1400 hp. Fairbanks-Morse engine, shown below, was installed and filled with *Gascon D*. This engine has never had a sticking ring and is running remarkably clean, with exceptionally low cylinder wear.

Perhaps Gascon® Oil can cure *your* diesel troubles, too. Get in touch with your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Ave., New York 20, N. Y.


Says Mr. Burgin, Superintendent of the Geneseo Municipal Utilities: "Sinclair GASCON has given us less varnish, less piston sticking, and a cleaner engine."
SINCLAIR DIESEL OILS prolong engine life

# Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

## Maintenance Costs of Large Heavy Duty Slow Speed Diesel Engines in Power Generation

### Part II

*Foreword:* The following is a continuation of a paper presented by Mr. J. B. Sims, Supt. of the Board of Public Works of Grand Haven, Michigan at the fall meeting of the Michigan Municipal Utilities Association, the first part of which appeared in the March issue of DIESEL PROGRESS.

*COOLING of Cylinder Walls, Chemical Reaction, Corrosion, Wear.* Condensation within the cylinder depends upon many factors, including humidity of the intake air, cylinder pressure and temperature variations, surface temperatures of cylinder walls, etc. The dew point may vary during the cycle of operation and this greatly influences the chemical reactions inside the cylinder. These chemical reactions are complex and there is considerable conjecture concerning their nature and the wear that they may cause. There is little doubt, however, that oxidation of the iron occurs and that the minute particles of displaced metal or material itself caused by wear contribute further to chemical reactions, particularly where difficult fuels are encountered.

*Lubrication Problems May Have Possibilities.* All operators are familiar with lubrication problems and the competitive lubricating oil situation where many an ambitious lubricating oil sales engineer may be ready and willing to assume the responsibility of meeting a wear situation which may not always be due to the lubricating oil itself, but more often to a combination of factors. Very often, however, improvements may be made in lubrication, even by the correct application of a different type of oil and it is difficult to evaluate the improvement of one brand or type over the other. One may be inclined to jump at conclusions based upon generalities or perhaps unjustifiable prejudice.

Recently, in a practical effort to evaluate the results of several types of lubricating oils in the cylinders of large 2 cycle diesel engines experiencing aggravated liner and ring wear due in no small measure to the burning of a relatively low grade straight run residual fuel oil from a nearby refinery, different types of lubricating oils were run for months under as near as possible identical conditions. Three test periods were run on two different 2 cycle, 9 cylinder, large bore, cross head engines having separate lubricators furnishing cylinder lubricant for each cylinder. Thus the upper cylinder lubricating system is entirely separate from the crankcase lubrication and the piston cooling oil, making it possible to use different oils on each cylinder.

A test was run on engine #6 for about 1,700 hours using three different types of lubricating oils. Two different manufacturers were represented. As will be noted from the attached Table II, cylinders 1, 2 and 3 used a standard brand of naphthenic base lubricating oil without additives and designated as "A." Cylinders 4, 5 and 6 used a newer developed and considerably more expensive oil with additives designated as "I." Cylinders 7, 8 and 9 ran on the same manufacturer's oil but of a different type and using less additives. This oil was less expensive to the customer than "I" and is designated as "O."

TABLE I

TEST SHOWING EFFECT OF OIL ON CYLINDER LINER WEAR
BOARD OF PUBLIC WORKS, GRAND HAVEN, MICHIGAN
ENGINE NO. 6

| Cylinder Number | Oil | Date Inspected | Bore Dia. Parallel to Crank (Inches) Position 1 | Position 2 | Position 3 | Bore Dia. Perpendicular to Crank (Inches) Position 1 | Position 2 | Position 3 |
|---|---|---|---|---|---|---|---|---|
| 1 - End of Test | A | 3/13/50 | 21.602 | 21.5875 | 21.5635 | 21.58925 | 21.58125 | 21.5575 |
| Beginning of Test | | 9/9/49 | 21.583 | 21.5465 | 21.531 | 21.551 | 21.547 | 21.532 |
| Difference | | | .019 | .041 | .0325 | .03825 | .03425 | .0255 |
| 2 - End of Test | A | 3/16/50 | 21.6005 | 21.592 | 21.5575 | 21.5905 | 21.583 | 21.5525 |
| Beginning of Test | | 9/9/49 | 21.579 | 21.5655 | 21.5415 | 21.572 | 21.561 | 21.5425 |
| Difference | | | .0215 | .0265 | .01425 | .0185 | .022 | .010 |
| 3 - End of Test | A | 3/13/50 | 21.6035 | 21.597 | 21.56325 | 21.599 | 21.5915 | 21.560 |
| Beginning of Test | | 9/2/49 | 21.579 | 21.573 | 21.548 | 21.572 | 21.568 | 21.547 |
| Difference | | | .0285 | .024 | .01525 | .027 | .0235 | .013 |
| Average | | | .023 | .0305 | .0207 | .0279 | .0266 | .0162 |
| 7 - End of Test | O | 3/13/50 | 21.623 | 21.6025 | 21.5615 | 21.597 | 21.58475 | 21.5535 |
| Beginning of Test | | 9/2/49 | 21.589 | 21.574 | 21.5425 | 21.577 | 21.563 | 21.541 |
| Difference | | | .034 | .0285 | .019 | .020 | .02175 | .0125 |
| 8 - End of Test | O | 3/13/50 | 21.581 | 21.57675 | 21.54875 | 21.580 | 21.570 | 21.541 |
| Beginning of Test | | 9/2/49 | 21.570 | 21.564 | 21.538 | 21.560 | 21.552 | 21.534 |
| Difference | | | .011 | .01275 | .01075 | .020 | .018 | .007 |
| 9 - End of Test | O | 3/13/50 | 21.582 | 21.5775 | 21.5565 | 21.579 | 21.5735 | 21.553 |
| Beginning of Test | | 9/9/49 | 21.567 | 21.5645 | 21.5395 | 21.565 | 21.563 | 21.541 |
| Difference | | | .015 | .013 | .021 | .014 | .0105 | .012 |
| Average | | | .020 | .0148 | .0169 | .018 | .0168 | .0105 |

With these three different oils from two suppliers ("A" from one and "I" and "O" from the other) being used on three cylinders each, micrometer readings were made at the start of the run on the bore of each liner at three positions, as noted. The positions were: No. 1—1¼-inch below top piston ring travel; No. 2—3¼-inch below; No. 3— 7½-inch below. The engine was operated under normal conditions of service for the period noted on the tabulation. At the end of this period, heads were pulled and micrometer readings were again taken in the same positions to determine the amount of wear. It was endeavored to make wear readings under reasonably near temperature conditions. All readings were made by the same maintenance mechanic. Results were tabulated and studied. Afterwards when studying the results, two of the readings looked so unusual that they were questioned, and a later reading indicated that they were incorrect, therefore they were not used in averaging the wear rates.

Another test was made on 3 cylinders of engine No. 2, which is a duplicate of engine No. 6 except for the fact that in normal service it ran more continuously than the later engine and was, therefore, not subjected to as many starts and stops during the test period. The average *initial* liner wear was not as great as that on engine No. 6 used in the prior test and it is felt that this might have influenced the results to some extent. It is regretable that it was not practical to run all the oils at one time on the same engine under duplicate conditions. Prior to this second test engine No. 2 had been operating with oil "A" on all cylinders. At the start of the test micrometer readings were taken on three cylinders as noted in Table III, and these three cylinders used oil "P" for the period noted. Oil "P" was of the same manufacture as "A," but of pariffinic base and was not an additive type. As will be noted, although the oils were not run on the same engine and under the same conditions, comparisons were made in order to indicate what the savings might be in the amount of liner and ring wear by improving lubrication.

Later another test on engine No. 6 was run for a period of 2,458 hours as noted in Table I. Cylinders 1, 2 and 3 used oil "A," and cylinders 7, 8 and 9 used oil "O" (additive type). It will be noted that the liners using oil "O" showed considerably less wear than the cylinders using "A." It was felt that these tests, far from being conclusive, indicated a distinct possibility of reducing maintenance and therefore, operating expense and it is planned to pursue these practical tests to a point where more

thorough conclusions can be made. The tests were begun with the suspicion that some of the wear was being caused by an acid condition accompanying the burning of fuel having a fair amount of sulphur or from other corrosive or erosive action. Therefore the first test was to try an oil with an acid inhibitor ("I" and "O"). Afterward it was decided to use the fourth oil "P," a straight paraffinic base oil on engine No. 2.

The following is an analysis of carbon found in the exhaust ports:

| | |
|---|---|
| Appearance | Hard black lumps |
| Odor | Oxidized |
| Total sulphur, % | 3.0 |
| Neutralization No. on extracted oil | 0.59 |
| Neutralization No. on oxidation products | 34.7 |
| Ash % | 16.5 |
| Spectrographic analysis | |
| Major components | Iron, calcium |
| Minor components | Sodium, nickel, silicon, magnesium |
| Sulfates | Present |
| 5% sulfates Ph value | 3.1 |
| Mineral acidity calculated as sulfuric acid, % | 0.44 |

The approach to the solving of the ring and liner wear problem has been from the acid and ash viewpoint. Engine operating temperatures have been increased recognizing that carbon dioxide, one of the products of combustion, is absorbed by the condensed water (another product of combustion) forming carbonic acid; sulphur dioxide will likewise form sulphurous acid. Both corrode cylinder walls, causing wear. This condition is aggravated by frequent starting and stopping. It is felt that salt may burn off into ash, resulting in abrasive action and that further filtration and treatment of the fuel may be desirable. There is, however, always an economic limit to the amount of treatment justified. In the burning of the more viscous and difficult fuels, it appears that there is an opportunity for much constructive work to be done in the field of practical filtration and treatment in the power plant. To ask the refiner to do this often results in the placing of the fuels into a special category and out of the normal industrial fuel oil class with perhaps resultant higher cost. It is difficult to prove that reduced maintenance could offset the additional cost of specially prepaired diesel fuel.

Laboratory tests of this straight run residual 24.1 A.P.I. fuel indicated the following:

| *Before centrifuging* | | *After centrifuging* | |
|---|---|---|---|
| Sulphur | .75% | Sulphur | .69% |
| Neut. | .19 | Neut. | .13 |
| Mineral acidity | 0 | Mineral acidity | 0 |

This is a topped crude residual fuel oil having the following general specifications:

| | | | |
|---|---|---|---|
| Fire | 410°F | Ash | 0.01% |
| Flash | 345°F | Conradson carbon | 3 to 5% |
| Visc. @ 100°F | 403 | Salt | 35/50 lbs./1000 bbls. |
| Pour Point | 60°F | Cetane | 42 |

It will be noted that the sulphur content was slightly lower after centrifuging than before. It is possible that this might be explained by assuming that some solids containing sulphur were removed by centrifuging. It has been found that, apparently due to the wax content, it appears to be preferable to limit the heating of the fuel prior to centrifuging to a maximum of 110°-130° range. It is noticeable that there are acid conditions which may vary due to lack of uniformity in the fuel. After the centrifuging the fuel is passed through Nugent bag filters into steam heated conical bottom settling tanks. Some trouble has been experienced with deterioration of the bags in the filters and yet mineral acidity and corrosion tests taken periodically do not always indicate excessive acidity. Following combustion, however, it is quite apparent that acid conditions do persist and while sulphuric acid is suspected as being the most corrosive, other including hydrogen sulphide ($H_2S$) sulphurous ($H_2SO_3$) and hydrochloric (HCl), or even carbonic ($H_2CO_3$) may, in various forms and combinations thereof, contribute to oxidation and resultant wear.

*Conclusions:* It may be interesting to note that the relative costs of the oils to the customer was as folows: "A"—naphthenis; "P"—paraffinic; "O"—additive type and "I"—additive type. It would appear, therefore, that "A" oil, while lower in cost per gallon, may be expensive in ring and liner wear, and that oil "P" or "O," while not as expensive as "I," may be equally efficient in preventing wear. More conclusive tests will be run between

TABLE II

TEST SHOWING EFFECT OF OIL ON CYLINDER LINER WEAR
BOARD OF PUBLIC WORKS, GRAND HAVEN, MICHIGAN
ENGINE NO. 6

| Cylinder Number | Oil | Date Inspected | Bore Dia. Parallel to Crank (Inches) Position 1 | Position 2 | Position 3 | Bore Dia. Perpendicular to Crank (Inches) Position 1 | Position 2 | Position 3 |
|---|---|---|---|---|---|---|---|---|
| 1 - End of Test | A | 9/9/49 | 21.583 | 21.5695 | 21.550 | 21.5715 | 21.565 | 21.5475 |
| Beginning of Test | | 4/29/49 | 21.556 | 21.5465 | 21.531 | 21.551 | 21.547 | 21.532 |
| Difference | | | .027 | .0230 | .019 | .0205 | .018 | .0155 |
| 2 - End of Test | A | 9/9/49 | 21.579 | 21.5695 | 21.5415 | 21.572 | 21.561 | 21.5425 |
| Beginning of Test | | 4/29/49 | 21.5525 | 21.545 | 21.529 | 21.545 | 21.541 | 21.526 |
| Difference | | | .0265 | .0205 | .0125 | .027 | .020 | .0165 |
| 3 - End of Test | A | 9/2/49 | 21.575 | 21.573 | 21.548 | 21.572 | 21.568 | 21.547 |
| Beginning of Test | | 4/29/49 | 21.55275 | 21.55275 | 21.533 | 21.548 | 21.54925 | 21.5315 |
| Difference | | | .02225 | .02025 | .015 | .024 | .01875 | .0155 |
| 4 - End of Test | I | 9/9/49 | 21.56975 | 21.55925 | 21.543 | 21.56175 | 21.5545 | 21.543 |
| Beginning of Test | | 4/29/49 | 21.557 | 21.546 | 21.5325 | 21.544 | 21.537 | 21.53125 |
| Difference | | | .01275 | .01325 | .0105 | .01775 | .0175 | .01175 |
| 5 - End of Test | I | 9/9/49 | 21.5585 | 21.549 | 21.541 | 21.568 | 21.558 | 21.5375 |
| Beginning of Test | | 4/29/49 | 21.5575 | 21.547 | 21.529 | 21.5485 | 21.538 | 21.533 |
| Difference | | | .0010 | .002 | .012 | .0195 | .020 | .0045 |
| 6 - End of Test | I | 9/9/49 | 21.576 | 21.562 | 21.540 | 21.565 | 21.555 | 21.5395 |
| Beginning of Test | | 4/29/49 | 21.558 | 21.547 | 21.533 | 21.5495 | 21.541 | 21.5335 |
| Difference | | | .018 | .015 | .007 | .0155 | .014 | .0060 |
| 7 - End of Test | O | 9/2/49 | 21.589 | 21.574 | 21.5425 | 21.577 | 21.563 | 21.541 |
| Beginning of Test | | 4/29/49 | 21.569 | 21.550 | 21.533 | 21.5585 | 21.546 | 21.534 |
| Difference | | | .020 | .024 | .0095 | .0185 | .017 | .007 |
| 8 - End of Test | O | 9/2/49 | 21.570 | 21.564 | 21.538 | 21.560 | 21.552 | 21.534 |
| Beginning of Test | | 4/29/49 | 21.561 | 21.549 | 21.5305 | 21.5455 | 21.537 | 21.52775 |
| Difference | | | .009 | .015 | .0075 | .0145 | .015 | .00625 |
| 9 - End of Test | O | 9/9/49 | 21.567 | 21.5645 | 21.5355 | 21.565 | 21.563 | 21.541 |
| Beginning of Test | | 4/29/49 | 21.553 | 21.551 | 21.533 | 21.551 | 21.5495 | 21.5315 |
| Difference | | | .014 | .0135 | .0025 | .014 | .0135 | .0095 |

TABLE III

TEST SHOWING COMPARATIVE LINER WEAR
WITH TWO DIFFERENT LUBRICATING OILS ON TWO SIMILAR ENGINES

| Cylinder Number | Oil | Date Inspected | Bore Dia. Parallel to Crank (Inches) Position 1 | Position 2 | Position 3 | Bore Dia. Perpendicular to Crank (Inches) Position 1 | Position 2 | Position 3 |
|---|---|---|---|---|---|---|---|---|
| Engine #6 | | | | | | | | |
| 1 - End of Test | A | 9/9/49 | 21.583 | 21.5695 | 21.550 | 21.5715 | 21.565 | 21.5475 |
| Beginning of Test | | 4/29/49 | 21.556 | 21.5465 | 21.531 | 21.551 | 21.547 | 21.532 |
| Difference | | | .027 | .023 | .019 | .0205 | .018 | .0155 |
| 2 - End of Test | A | 9/9/49 | 21.574 | 21.5695 | 21.5415 | 21.572 | 21.561 | 21.5425 |
| Beginning of Test | | 4/29/49 | 21.5525 | 21.545 | 21.529 | 21.545 | 21.541 | 21.526 |
| Difference | | | .0265 | .0205 | .0125 | .027 | .020 | .0165 |
| 3 - End of Test | A | 9/9/49 | 21.575 | 21.573 | 21.548 | 21.572 | 21.568 | 21.547 |
| Beginning of Test | | 4/29/49 | 21.55275 | 21.55275 | 21.533 | 21.548 | 21.54925 | 21.5315 |
| Difference | | | .02225 | .02025 | .015 | .024 | .01875 | .0155 |
| Engine #2 | | | | | | | | |
| 2 - End of Test | P | 1/16/50 | 21.533 | 21.5325 | 21.52275 | 21.528 | 21.521 | 21.5195 |
| Beginning of Test | | 10/5/49 | 21.522 | 21.516 | 21.516 | 21.518 | 21.514 | 21.514 |
| Difference | | | .011 | .0165 | .00675 | .010 | .007 | .0055 |
| 7 - End of Test | P | 1/16/50 | 21.562 | 21.5605 | 21.5395 | 21.56275 | 21.561 | 21.5355 |
| Beginning of Test | | 10/5/49 | 21.551 | 21.547 | 21.5325 | 21.552 | 21.5475 | 21.528 |
| Difference | | | .011 | .0125 | .007 | .01075 | .0135 | .0075 |
| 9 - End of Test | P | 1/16/50 | 21.552 | 21.550 | 21.530 | 21.550 | 21.546 | 21.5265 |
| Beginning of Test | | 10/5/49 | 21.547 | 21.5415 | 21.527 | 21.543 | 21.53625 | 21.522 |
| Difference | | | .005 | .0085 | .003 | .007 | .01025 | .0045 |

Note - Engine #6 experienced more intermittent operation than Engine #2.

Hours run on #6 - 1700
" " " #2 - 1991
(Interpolation was made for 1700 hrs. on graph Fig. A for oil "P")

"O" and "P" oils. Also it is planned to test others.

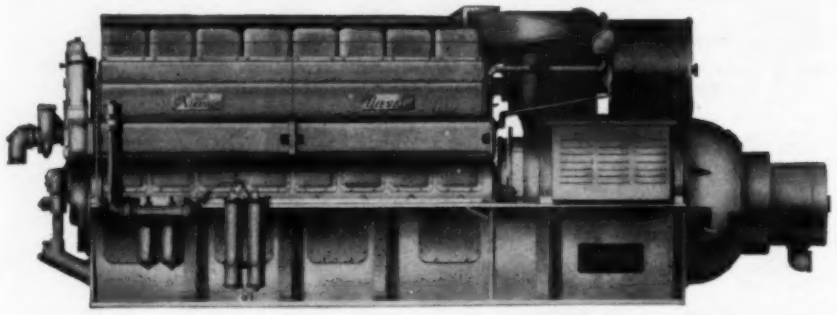
Preceding the lubricating oil tests, a study was made of the accumulated liner and ring wear cost over a period of years, burning difficult fuels. The assumed costs of replacement were as follows:

New liner—$1,295.00 each.
New rings—$9.00 each.
Cost of new liner installed—$382 each.
Cost of new rings installed—$61.00 per set.
Labor per hour—$1.36 (average).
Ring installation—12 manhours.

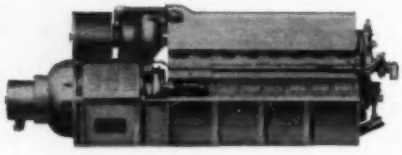
However, since this analysis was made, liner replacement costs have increased considerably. In studying this accumulated liner-ring life, several conclusions may be reached. (1) Generally speaking, the initial liners installed at the time the engine was installed appeared to have, on the average, slightly longer life than replacement liners. This was difficult to explain but might be attributed to several reasons, among them, the fact that the engine's injection system and other parts were perhaps in better condition during the first years of its life. Also the ring grooves in the pistons may have been in better condition when new, allowing better sealing. (2) Local conditions such as a change in the type of fuel or lube oil may have had an influence. It is also quite noticeable that the frequency of piston pulling and ring replacement becomes more pronounced as the wear accumulates and finally it becomes necessary to pull and replace the liner. A further study indicates that in several instances it would have been more economical to have replaced the liner earlier. (3) In several instances it was noticed that the liner's life was exceptionally short. This was due to a siege of broken liners which was in part traced to air getting into the cooling water system from an air cooler causing poor circulation and improper cooling.

(This article will be continued in the next issue of DIESEL PROGRESS.)


# Sterling Viking Diesels definitely lower costs of power production



Model VDS-8S, 600 KW Generator Set. Viking Diesel "packaged unit" generator sets are available in 6 and 8 cylinder models. Bulletins 1024 and 1028 contain sectional views, fuel consumption curves, engineering and installation details. Sent on request.



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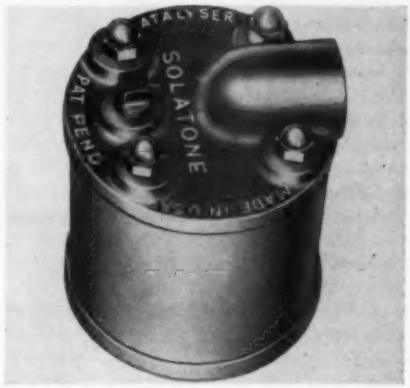
## A. B. Hydrocarbon Systems




In 1928, Andre Barbier, eminent physicist, brought to light a new form of catalysis, independent of any chemical agent. For the practical application of this discovery, necessarily numerous years of research followed. Today, many companies in France, Western Europe and the United States (Sola Catalytic Company), apply this patent. In 1948, Mr. Barbier began his research for the treatment of hydrocarbons and derivatives and shortly afterward began research in the field of petroleum oils and their application in various industrial fields. An apparatus named "Solatone," a product of A. B. Hydrocarbon Systems, entirely new, was designed to avoid the formation of carbon deposits, gum and varnish without the risk of emulsion or discoloration of the lubricants and at the same time eliminate the use of oil detergents for all engines (diesel, gas, dual-fuel, passenger cars) and for the lubrication of compressors and automatic machines, etc.

Actually a special model for diesel engines is immediately available. For organic and inorganic plants, many giant models will be available shortly. The laboratory of A. B. Hydrocarbons Systems is at 2808 McKinley Avenue, Dallas, Texas and is directed by Mr. Barbier himself.

## Appointed Director of Research

Robert S. Ingersoll, president of the Ingersoll Products Division of Borg-Warner Corp., has announced the appointment of Thur Schmidt as director of research and development for the division. He formerly held the position of assistant to the president. Having been engaged in research activities since 1937, Mr. Schmidt will devote his efforts to the development of new manufacturing processes, as well as new products and markets.

## General Manager of Electro-Motive Division

Nelson C. Dezendorf

C. E. Wilson, president, General Motors, announced the appointment of Nelson C. Dezendorf, general manager of Electro-Motive Division, La Grange, Illinois, effective immediately. Mr. Dezendorf, director of sales of Electro-Motive, since June 1945 succeeds B. A. Dolens who died February 9th. Mr. Dezendorf attended the University of Oregon and after service in the Army during World War I returned to the University of California to obtain a degree in engineering. Mr. Dezendorf entered the employ of General Motors Acceptance Corporation at Portland, in May of 1922. He became a vice president of General Motors Acceptance Corporation in 1931 and director and member of the executive committee in January 1941. In October 1941 he relinquished these positions to become general assistant to the vice president in charge of the distribution staff of General Motors. Prior to his appointment as director of sales for Electro-Motive, he served for 18 months as director of General Motors distribution staff in Detroit. Mr. Dezendorf was born in Portland, Oregon, April 23, 1898. He is married and has twin daughters, Diane and Susan. They reside in Hinsdale, Illinois.

## Named Manager

John T. Weber

John T. Weber has been named manager-sales development, Cummins Engine Company, Inc., Columbus, Indiana, succeeding Howard P. Sharp, who resigned recently. In announcing the appointment, L. W. Beck, Cummins' vice president-sales, indicated that Mr. Weber's duties will include the coordination of the company's advertising, technical literature, market research, sales training and publicity programs. Mr. Weber joined the Cummins organization in October, 1947, and had served as assistant to the controller, until his new appointment. He is a native of St. Louis, Missouri, holds a Bachelor of Science Degree in Business Administration from Washington University, St. Louis. He also has a Master of Arts Degree in Business Administration from Harvard Graduate School of Business Administration, Boston.

## Opens Diesel Shop

As another stride toward its postwar goal of system-wide dieselization, the New York Central System has opened a new $2,000,000 diesel maintenance shop at its Stanley Yards, Toledo, O. The huge shop, according to C. F. Wiegele, general manager, lines west of Buffalo, will be the servicing headquarters for approximately 110 of the road freight and switch diesels operating in the Central's Michigan Central, Ohio Central and Big Four districts. More than two years in construction, the shop incorporates the most modern facilities for diesel servicing and repairing.

The three-story main shed houses three through tracks on which diesels are run for normal servicing and minor repairs. A fourth pair of tracks in the 165-by-240-foot building are stub ends for heavier repairs and rebuilding. A new-type lubrication system and a specially designed fire-fighting system are two of the modern features in the shop, which was built also to allow a maximum of light and to keep dirt and dust in the work area to a minimum. The lubrication system permits servicing of nine units simultaneously, doubling the capacity of conventional systems in other shops. The east wing of the shop houses the offices and storeroom. Just outside the main shed new wash racks have been erected so that the diesels can be scrubbed thoroughly before being serviced. Nearby, also, is a sanding and fueling station.

As a part of the over-all dieselization plan at Stanley Yards, the Central presently is constructing a $300,000 dormitory and restaurant building for road crews. When completed in the near future, that building will contain 86 individual sleeping rooms for crews laying over at Stanley as well as a restaurant with a seating capacity for 44 persons. In addition, there will be locker facilities for 84 men and a 120-person assembly room.

# Blanket Lift

Boot leather was bitter, but better than starving. To keep their feet from freezing, they wrapped them in blankets — and found the blankets served as snowshoes!

That's what Fremont and his men needed — as critically as the wearing surfaces of Diesel engines need renewal.

But Diesel owners aren't waiting for the "boot eating" stage. They know the parts shortage can be as severe as the 1848 blizzard that caught Fremont's expedition in the Rockies.

Carloads of worn out liners — and crankshafts too — are being saved from the scrap heap with VANDERLOY M. At our new plant (largest of its kind in existence) this pure, electrolytic iron restores such parts to original dimensions.

Then, with PORUS-KROME* added, they go back into service — and earn up to four times the total processing cost.

To avoid a risk such as Fremont's, many Diesel users make sure of their equipment by having it Van der Horst processed when new. They find it a blanket answer to problems of wear and performance — and gives a blanket lift to their profits.

*PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

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**PORUS - KROME** VAN DER HORST

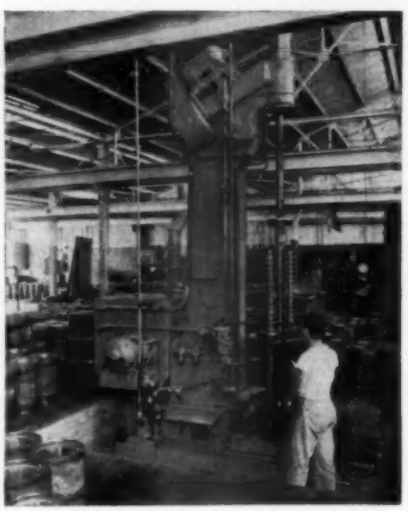
## New Warehouses for Federal-Mogul

**Architect's drawing of Federal-Mogul's proposed zone warehouse in Sacramento.**

Federal-Mogul Corporation of Detroit, Mich., has announced two new zone warehouses, one in North Kansas City, Mo., and one in Sacramento, Calif. The Kansas City warehouse went into operation in January and construction of the California warehouse was started in the same month. The announcement was made by N. A. Moore, vice president of Federal-Mogul's Service Division. Purpose of these new zone warehouses is to provide faster bearing service out of locally maintained inventories and improved connecting rod shop facilities for the company's service branches in the central and west coast areas. Each zone warehouse will maintain a master inventory of the company's more than 8,000 engine bearing, bushing, and Bower roller bearing part numbers and other related parts as well as four production lines for rebabbitting and reconditioning connecting rods.

Designed specifically for the planned operation, the zone buildings are one-story brick, with 25,600 square feet of floor space in each one. Approximately one-eighth of this area is office space. The balance is devoted to warehousing, rod shop, and packaging and shipping operations. The Kansas City warehouse is managed by H. B. Riley, who was formerly in charge of Federal-Mogul's Kansas City district. Approximately 75 persons will be employed there when full operation is reached. Completion of the Sacramento warehouse is scheduled for mid-July, 1952. The Sacramento zone will be managed by E. G. Jackson, who will transfer from managership of the Dallas district.

## Available on West Coast Soon



**Honing liners in the Spar-Tan Company plant preparatory to applying the Porus-Chrome plating.**

The Spar-Tan Engineering Company of Los Angeles, California, licensee of the Van der Horst Corporation of America, will make the Vanderloy M process available on the west coast about the middle of the year. By means of the Vanderloy M process, worn bearing and cylinder surfaces are built up again to new condition with electrolytic iron. (A full description appeared in the January 1952 issue of DIESEL PROGRESS.) The potential saving of skill, man-hours, production capacity and critical materials is represented by the fact that each pound of Vanderloy M saves a replacement of a minimum of forty pounds (to a maximum of 400 pounds) of difficult-to-make and precision-machined parts.

Because this process rebuilds worn parts to original thicknesses, it makes unnecessary the carrying of odd size parts in stock. All parts can be returned to standard size and, as they wear, can be reprocessed again and again.

The Spar-Tan Engineering Company is expanding its facilities to make this process available for west coast service. The company, at present, is devoting its entire plant capacity to the Van der Horst "Porus-Chrome" process. "Porus-Chrome" is a glass-smooth, diamond-hard plating that retains oil. It has gained wide acceptance as a means of multiplying the service life of cylinders and other bearing surfaces.

# THE EXPERIENCE OF A PIONEER CANNOT BE ACQUIRED OVERNIGHT

**The men who led the westward movement of our people across America's plains and mountains had to learn many of their lessons from one unfailing teacher. That teacher, then and to this day, is Experience. There is no substitute for it. You cannot enjoy its benefits by reading about it, nor merely by copying the actions of others or voicing, parrot-like, their well-learned principles. This is as true in learning how to protect fuels, lubricants and machinery from dirt as it was in learning how to protect those pioneering settlers from hunger, thirst or the attacks of savages. So we say: *The makers of Winslow Filters and Elements have been pioneering the principle and successful application of Full-Flow filtration for nearly twenty years.* We take pride in original patents which we hold, and we congratulate those other manufacturers who are finally beginning to endorse the same ideas. But to those of you who are buying *full-flow filters*, we repeat: The experience of a pioneer cannot be acquired overnight. For added value born of experience, specify Winslow Filters!**

**FOR EVEN GREATER SAFETY, REMEMBER THE WINSLOW WARRANTY. ASK ABOUT ITS PROTECTION OF *YOUR* COSTLY EQUIPMENT!**

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### Directs Engineering and Production

Helmuth G. Braendel

Announcement has been made by F. W. Wilkening, president of Wilkening Manufacturing Co., maker of Pedrick piston rings, of the appointment of Helmuth G. Braendel as director of engineering and production. For the past seven years, Mr. Braendel has been Pedrick's chief engineer. He has taken an active part on programs of the Society of Automotive Engineers and the Diesel Engine Manufacturing Association. He is the author of a number of technical papers on piston and piston ring design, performance and maintenance. According to the announcement, Mr. Braendel will head all technical and production activities at Wilkening. Harry O. Moffett has been appointed his assistant, and William J. Miller, production manager.

### Expands Aluminum Production

The first expansion unit of Texas' booming aluminum industry recently began operating to meet the growing needs of America's national defense program. With the flick of a switch, George R. Stout, manager of the Point Comfort Works of Aluminum Company of America near here, set the first of two new smelting lines into operation at the plant. The new line increases Point Comfort's production capacity to about 135,000,000 pounds of aluminum annually, and constitutes a major step toward alleviating the national aluminum shortage. By terms of a contract signed last fall by Alcoa and the General Services Administration, the U. S. Government will get first call for five years on the output of the two new Point Comfort units.

The second new line is scheduled for completion within three months. The Point Comfort smelting facilities are operated with electrical power generated through the use of natural gas. When the plant reaches full production it is expected that gas consumption will rise from the present 30,000,000 cubic feet per day to about 50,000,000. The capacity of the power plant will be raised from 120,000 kw. to about 200,000 kw. Seventy-four new Nordberg radial gas engines are being installed to supply electricity for the new potlines. These will be in addition to the 12 engines which make up the original power plant. The new engines will be similar to those already operating, except that they will have 12 cylinders instead of 11 and will have about nine percent greater output per engine. The Point Comfort Works started production in February 1950, to become the first new aluminum producing plant built after World War II.

### Establishes Development Lab

Borg-Warner Corporation has announced the establishment of a Products Development Laboratory, in Detroit, as a separate division entrusted with responsibility for carrying both defense and civilian items from the invention stage to actual production. The development of new products for war use and the improvement of automatic transmissions are the projects which are being given priority by the staff of more than 50 engineers, designers and other technicians at work under the direction of David T. Sicklesteel, newly appointed general manager of the laboratory. Mr. Sicklesteel previously was vice president in charge of engineering with the Detroit Gear Division of Borg-Warner.

The laboratory, occupying 20,000 square feet of floor space at 8651 East Seven Mile Road, Detroit, has been equipped with electric- and gas-driven dynamometers and other testing devices as well as with highly modern machine shop tools. There also is a special fleet of passenger cars and trucks for the road-testing of transmissions, torque converters, transfer cases and other automotive equipment under development in the laboratory.

In addition to Mr. Sicklesteel, an advisory committee will assist in the direction of the laboratory. Members of the committee are C. S. Davis, chairman of the board of Borg-Warner; Roy C. Ingersoll, president of Borg-Warner; Howard E. Blood, vice president of Borg-Warner; A. J. McAllister, president of the Detroit Gear Division; and E. S. Russey, vice president of Warner Gear Division.

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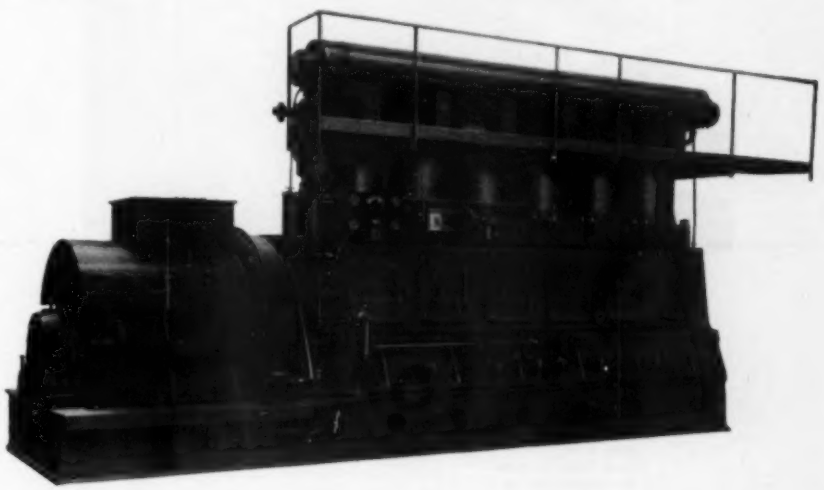

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Yale & Towne selected a *Twin Disc* Hydraulic Coupling to put the power to work on its *new* "*Diesel-Lift*" fork truck. And here's why:

This "double circuit" *fluid drive* eliminates chattering, stalling and lugging . . . eliminates, too, damaging starts and stops—and assures the *availability of full engine power* for heavy pulling and steep ramp work.

*Cushioned* power that *bangs* on . . . velvet glove power that permits the engine to work in its most efficient range *all the time* . . . these are the advantages you get with Twin Disc Hydraulic Couplings. And because these couplings are of "double circuit" design, thrust loads are fully balanced, and the coupling occupies less diameter per hp.

Chances are you, too, like Yale & Towne, will turn to Twin Disc Hydraulic Couplings for *new* performance characteristics from your equipment when you learn the complete story. Write today for Bulletin No. 144-C on fluid drives. No obligation.

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## Des Moines Facilities for Cummins

Cummins Diesels are now being sold and serviced in eastern and central Iowa by Cummins Diesel Sales Corporation, with headquarters at University and Illinoist Streets, Des Moines. Territory for the new Cummins sales and service outlet will include these portions of Iowa, with the exception of Scott County. When announcing the opening of the Des moines facilities, L. W. Beck, vice president-sales of Cummins Engine Company, Inc., at Columbus, said that the Des Moines installation will operate as a branch of Cummins Diesel Sales Corporation, Omaha. Omaha will continue to serve customers in Western Iowa.

Mr. Beck also said that James M. Gleason, former senior salesman at the Cummins Chicago dealership, has been named to the position of acting branch manager. L. H. Hanlon is in charge of the office and parts departments, and Joseph Boston heads the service department. The new Des Moines dealership is located on State Highway 60 and is near major truck line terminals and is also adjacent to the headquarters of many contracting companies. The shop has equipment for complete service work, and will do fuel pump and in chassis overhauling. Six truck bays are included in the 45 x 80 building. A complete stock of genuine Cummins-warranted parts also is available.

## Canadian Milestone

**The 200th locomotive built by General Motors Diesel Limited, London, Ontario, is shown as it was delivered to Algoma Central and Hudson Bay Railroad. Left to right: GMD's acting general manager, John W. Brophy; William R. Esson, master mechanic of the Algoma Central; and GMD sales engineer D. A. Coape-Arnold.**

Another milestone was reached by General Motors Diesel Limited, London, Ontario, Jan. 15, when the 200th locomotive built since the big plant was opened in August, 1950, was delivered to the Algoma Central and Hudson Bay Railway for service on the main line in Northern Ontario. The 1,500 horsepower general purpose unit was the 17th locomotive built by GMD for the Algoma Central. William R. Esson, master mechanic of the Algoma Central, accepted the locomotive at a brief ceremony attended by GMD officials including acting general manager John W. Brophy, works manager George D. Baker, general superintendent Sidney Phillips, chief inspector Howard King and sales engineer D. A. Coape-Arnold.

Engaged in a complete dieselization program for its 322 miles of track, from Sault Ste. Marie to the northern terminal at Hearst, the Algoma Central has constructed modern diesel shops at the Sault.

The railroad serves the rich Michipicoten iron ore country, hauling ore, steel products, coal, pulpwood, sulphur, coke, as well as general freight over its lines. It also taps a tourist and sportsman's paradise which is famous all over America.

General Motors Diesel's 200th unit completed a total of 256,500 locomotive horsepower turned out to date at the London plant, which now has a floor area of 280,247 square feet with the new Engineering and Development Centre which was completed last year. Since it started operations, GMD has sold locomotives to 12 Canadian customers, including 11 railroads. At the end of last year, the company had delivered a total of 196 units, made up of 30 locomotives in 1950, and 166 in 1951. GMD's 11 other customers besides the Algoma Central are: Canadian National Railways, Canadian Pacific Railway, Toronto Hamilton and Buffalo Railway, Chesapeake and Ohio Railway (Pere Marquette District), Wabash Railroad (Canadian Division), Ontario Northland Railway, Great Northern Railway (Canadian Division on the west coast), Quebec North Shore and Labrador Railway, Essex Terminal Railway, Canada and Gulf Terminal Railway, and the Steel Company of Canada.

E. V. Rippingille, Jr.

John W. Brophy

General Motors Diesel is a wholly-owned subsidiary of General Motors Corporation. The parent Electro-Motive Division at LaGrange, Illinois, dates back to 1922 and was bought by General Motors in 1930. GM-type diesels recently went on the mainline in Australia in a project undertaken by Electro-Motive with Clyde Engineering Co. Pty. Limited, in Sydney. GMD's 42-year-old president and general manager, E. V. Rippingille, Jr., recently was appointed director of the aircraft division of Canada's department of defense production. He will continue as president while on loan to the government. John W. Brophy, who is now serving as acting manager in Mr. Rippingille's absence, was formerly director of production control and purchasing. He is a General Motors veteran of over 20 years.

## Elected President of AED

Mr. Harry J. Hush, vice president and secretary of Griffin Equipment Corporation, New York, has been elected 1952 president of Associated Equipment Distributors, the national trade association of the construction equipment industry. Mr. Hush succeeds Mr. R. L. Arnold, Arnold Machinery Company, Salt Lake City, Utah, as president of the association. His election took place in Chicago recently at a convention attended by more than 2,600 American and Canadian construction equipment distributors and manufacturers.


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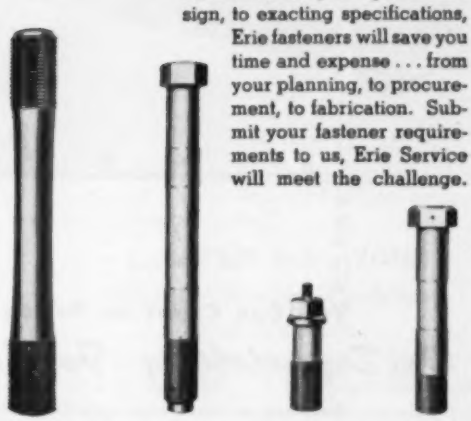
Precision and Quality Workmanship, backed up by 38 years of Erie experience, are yours for thoughtful buying. Whether you require a fastener made from carbon, alloy or stainless steels, to special design, to exacting specifications, Erie fasteners will save you time and expense . . . from your planning, to procurement, to fabrication. Submit your fastener requirements to us, Erie Service will meet the challenge.



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ERIE • PENNSYLVANIA

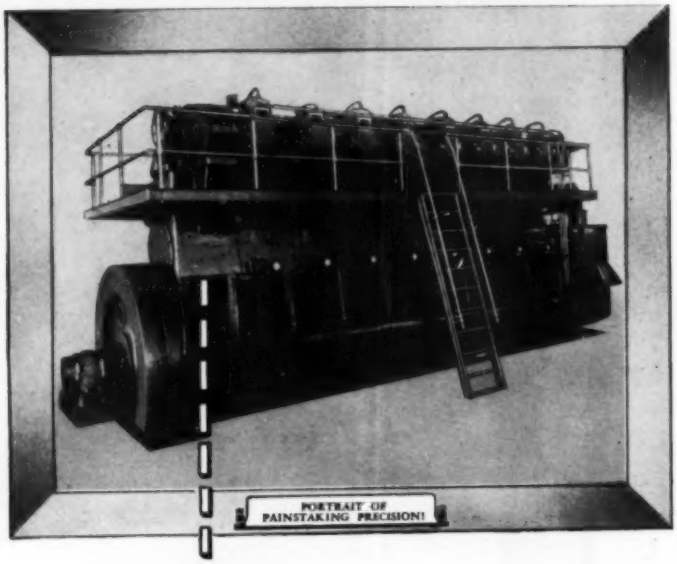
STUDS • BOLTS • NUTS
ALLOYS • STAINLESS
CARBON • BRONZE

*Representatives in Principal Cities.*

## New Pen Designed for Instruments

New industrial instrument pens that eliminate flooding and reduce paper plugging and choking have been designed by Minneapolis-Honeywell Regulator Company for their strip chart electronic instruments. The new pens have removable tips and a new reservoir construction which eliminates flooding because the effective ink level is always below the writing tip. Among other advantages are: The pen operates with decreased pressure on the instrument chart, tending to reduce paper fibre choking; thorough cleaning is made easy by a simple disassembly, and the new design fits on standard pen carriages, permitting improved performance for already installed instruments.

A clear glass reservoir has the same ink capacity as the reservoir in the older glass-barreled pen used on these recorders. Clamped to the reservoir is a metal carrier to which the metal capillary neck is attached. The tip, which screws into a threaded connector on the neck, is equipped with a knurled-screw grip and is easy to unscrew. It can then be cleaned by passing a small-diameter wire through it from the rear, where the opening approximates that of the capillary—much larger than the tip opening. Not only will clogging material never be pushed back into the reservoir, but the wire insertion is easy. The entire pen assembly can be removed for any required cleaning or washing. Its mounting ears simply slip over the pen carriage bracket. The writing tip is made of platinum alloy. It will wear even better than former models because the pen pressure has been decreased to about one third through the use of the counterweights.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*For Dependability..For Economy*

Smoother-running • peak operating efficiency • greater fuel economy • less wear and tear • quick, easy replacements that save time and money . . .

*Because* . . . even the heaviest parts of every Fulton Diesel are machined to such close tolerance that they are completely interchangeable.

FULTON

**FULTON IRON WORKS COMPANY**

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## New Governor

Accurate, dependable speed control for all popular industrial and farm engines is offered with the new Long Range Universal Governor, recently developed by The Pierce Governor Company, Inc., Anderson, Indiana. Ideal for engines operating corn shellers, drag lines, hoists, trucks and tractors with power take-offs, arc welders, etc., the new Universal prvides instant variable speed selection and correct engine control at any speed setting within 1200 to 2600 rpm. Higher speeds are obtainable by simple adjustment of pulley. Operating spring and weight are similar in any speed range. The new governor operates equally as well at variable speeds or at constant speeds. For variable speed operation, a quadrant or similar manual control sets the governor to desired speed. Constant speed operation is provided by locking speed control lever at fixed speed.

Long Range Universal is easily installed, according to the manufacturer and can be mounted on either side of the engine. Speed control lever, carburetor control lever and mounting flange fit either side of the governor. For complete details write The Pierce Governor Company, Inc., Anderson, Indiana.

## Controller of Morse Chain

Frank M. Hawley, president and general manager of Morse Chain Co., a division of Borg-Warner Corp., has announced the appointment of Virgil P. Burgess as controller and acting secretary-treasurer of the division. Mr. Burgess previously was assistant secretary of Morse Chain Co. His new appointment follows the recent resignation of Walter M. Reynolds as secretary-treasurer. Mr. Burgess joined Morse Chain Co. on August 15, 1945, becoming successively chief accountant in the Detroit plant, assistant controller in the Detroit plant, and controller in the company's Ithaca, N.Y., plant. He was elected assistant secretary in 1950.


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ATLANTIC flexible metal hose does a *better* job of controlling vibration of these vital lines and insuring their continuous, trouble free operation—because each section is *Job Tested and Guaranteed to Do Its Job!*

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Write for Diesel Bulletins 1020 and 50A. It Saves Costly Coupling or Fitting Kits for Repeat Designers.

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***500 Series***
***Rotary Geared Pumps***
***with Herringbone Gears***

These quality-built Brown & Sharpe pumps are particularly suited for diesel pressure lubricating systems up to 500 p.s.i. Needle bearing construction, combined with balanced herringbone gear design, assures smooth, dependable operation at high speeds. Leakage problems eliminated by use of double self-balancing mechanical seal . . . no glands to adjust. Six sizes available with capacities from 5.1 to 37.6 g.p.m. at 0 lbs pressure. Operating characteristics fully described in Pump Catalog. Write for copy. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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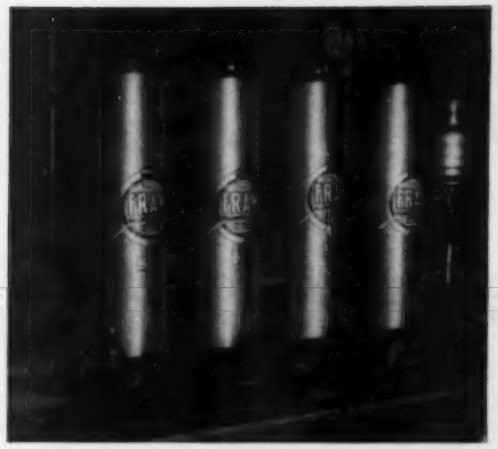

*This unit of four Fram Filters serves two 500 hp air injection Fulton Diesels in large eastern quarry. Another unit of three Fram Filters protects 1000 hp solid injection Fulton Diesel from harmful quarry grit and dust.*

**FRAM FILTERS Protect Vital Diesel Engines from Quarry Contaminants**

Two Fram Filter installations protect a large Eastern quarry's vital diesels from damage by engine-killing sand, lime and cement. These diesels drive generators that supply the entire plant with power . . . must operate 24 hours a day, 6 days a week to maintain production.

The quarry's chief engineer is plenty enthusiastic about time- and money-saving Fram Filters —says all his diesels must be Fram-equipped for maximum service.

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- protect your diesels
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## Cooper-Bessemer Opens New Office

T. E. Kraner

F. A. Gehres

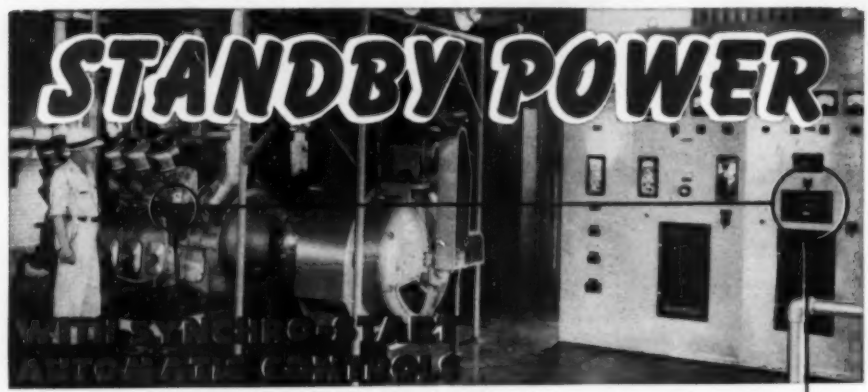
A combined regional office and warehouse has just been established at New Orleans by The Cooper-Bessemer Corporation, according to Mr. Stanley E. Johnson, vice president. Operating under the direction of Mr. T. E. Kraner, branch manager, Cooper-Bessemer's new district facilities now provide direct factory representation for all engineering service requirements on engine and compressor applications. In addition, the new warehouse stocks essential parts for servicing marine and industrial installations currently operating in the Southern Gulf Coast area. Working directly with Mr. Kraner is Mr. F. A. Gehres, assistant branch manager. "The rapid expansion of industry in the South, spurred in part by the defense program, naturally has created increased demands for more and more engineering assistance from engine and compressor builders," Mr. Johnson points out. "Projected needs in this part of the country we believe now indicate the advisability of setting up a direct factory office as has been the practice in other industrial regions of the nation.

"For many years Cooper-Bessemer has been very capably represented in this area by the Calmes Engineering Company," Mr. Johnson goes on to explain. "As shipbuilders, however, their principal concern has been in diesel engines for marine use. As a result, requests for stationary engines used in power generation, in chemical or industrial processing, in many cases had to be engineered from the factory at Mount Vernon, Ohio. In view of the ever-growing burden for broader engineering experience so essential on stationary installations, both Calmes Engineering and Cooper-Bessemer have felt it would be more practical for all concerned if Cooper-Bessemer were to set up a direct field office staffed by factory trained specialists. At the same time such a plan would help relieve demands on Calmes Engineering personnel and enable them to concentrate more engineering manpower to their expanded shipbuilding program." Mr. Kraner, who directs Cooper-Bessemer's sales and service activities at New Orleans, has been associated with this engine and compressor builder since 1937 when he first started in the engineering department at the headquarters plant in Mount Vernon, Ohio.

Mr. F. A. Gehres started with Cooper-Bessemer in 1939 as application engineer before being assigned to its district office at Houston, Texas. In the war years he was stationed at the Navy parts depot in Harrisburg and later served as an officer in the South Pacific. During his service at Houston, he engineered the installation of compressors and engines on cross-country pipe lines as well as in petroleum processing plants and diversified industrial applications. Located at 1410 South Jefferson Davis Parkway, the new district office and warehouse is part of Cooper-Bessemer's nationwide distribution program to assure prompt service on essential parts for engines and compressors. The location at New Orleans also gives quick access to principal industrial and shipbuilding areas.

## Technical Paper Available

"Application of Direct-Connected Synchronous Motors to Reciprocating Compressors" is a reprint of a paper presented at the New York Section of A.I.E.E., Power & Industrial Division, Motor Selection and Application Courses late last year. Written by G. L. Oscarson, chief application engineer, Electric Machinery Mfg. Company, this discussion deals largely with consideration of proper rotor flywheel effect ($WK^2$) as a preventive measure for voltage fluctuations when driving reciprocating compressors with direct-connected synchronous motors. Examples complete with formulas, sample calculations, and reference curves are included in this booklet. A worthwhile addition to the engineers reference library, this 12-page technical article is available on request from Electric Machinery Mfg. Company, Minneapolis 13, Minn. Ask for Publication No. 1200-TEC-1111.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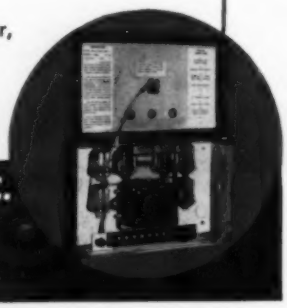
The need for automatic standby power has increased from year to year due to the vast savings they have afforded. Now, with the imminent possibility of bombing our cities and disrupting essential services, the need has greatly increased and deserves serious consideration by all power users.

For the past twenty years, SYNCHRO-START has made dependable controls to automatically start these power plants when power was required, and to stop them when power was no longer needed; also, to protect the power plants and their equipment from damage due to abnormal conditions while starting and running.

The above picture is typical of the many thousands of other SYNCHRO-START automatically controlled standby power plants that are in use throughout the world under every conceivable power requirement; on land, sea, in the air, and in the mines.

Contact your Architect, Engineering Firm, Engine Dealer, or Engine Manufacturer, for further information, or write us about your needs and our nearest representative.



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## Four-Wheel Drive Tractor-Shovel

The Frank C. Hough Co., 913 Seventh St., Libertyville, Ill., has made available another four-wheel drive "Payloader" tractor-shovel. It has a one-cubic yard bucket with 60 hp. diesel or 54 hp. gasoline power optional. This Model HR "Payloader" is similar to the big 1½ yd. Model HM that has been so well received by contractors, public works departments, mines ,quarries, railroads and all types of plants having earth and bulk material moving applications. The use of large pneumatic tires, same size all around, and drive on all four wheels gives this new "Payloader" tremendous traction and flotation to work effectively in sand, mud and snow and travel on pavements without injuring the surface. Rear wheel steer with power booster plus short wheel base makes it easy to operate and highly maneuverable. Four speeds in both directions insure fast travel speeds.

A powerful automatic digging action independent of the forward motion of the "Payloader" is an inherent characteristic. Automatic quick tip back of the bucket is also provided so that heaped bucket loads can be retained without spilling and can be carried low for good machine balance and full operator visibility. The twin hydraulic boom rams are double acting, also the ram that dumps and closes the bucket. Bulldozer blade, crane hook, fork lift and snow plow attachments are available, quickly interchangeable with the bucket to further increase its multipurpose usefulness. Literature and further details including the name of your Hough "Payloader" distributor can be obtained from the manufacturer.

## Mobile Diesel Schools Tour Again

Four mobile diesel engine training schools sponsored by General Motors Truck Division and the Detroit Diesel Engine Division left on nation-wide tours again in February to bring factory-approved servicing procedures to hundreds of diesel truck mechanics and operators. At a dinner given by Detroit Diesel Engine Division for the instructors and service officials of GMC Truck preceding the departure of the units, L. A. Steele, Detroit Diesel's automotive and tractor sales manager, said the introduction in 1951 of GMC's new line of diesel trucks greatly emphasized the importance of this training. He pointed out that with the ten-fold increase in sales of GMC diesel powered trucks since 1947, GM diesel power was now relatively new to many more first time users. Each of the schools is equipped with over four tons of training aids including "live" and cutaway engines, engine assemblies, tools, motion pictures, slides and charts. Almost 2,000 diesel mechanics took the courses last year through GMC distributors and dealers.

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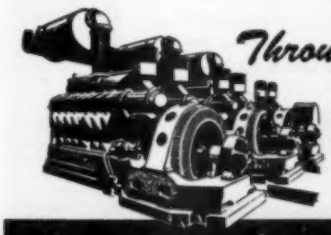
You are assured of high efficiency in heating or cooling – long service life – low maintenance and service costs, when you specify Aerofin extended-surface heat exchangers.

The reason is obvious: Aerofin makes heat exchangers *exclusively* — offers you the results of unequalled experience, unequalled production facilities, unequalled materials testing and design research — and the guidance of a complete, highly skilled engineering staff, at the plant and in the field.

For the most practical solution to your heat-exchange problem, ASK THE AEROFIN MAN.



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**Aerofin units do the job Better, Faster, Cheaper**

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*Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.*

## Hydraulic Line Servicing Unit

A new standard filling-bleeding tank for use in servicing hydraulic lines is announced and now being manufactured by Superdraulic Corporation, 14256 Wyoming Avenue, Detroit 4, Michigan. This new unit holds 2½ gallons of oil and meets military specifications No. MIL-T-5182. It is also readily adaptable to use with all types of hydraulic systems in automotive, aircraft and other equipment. It is equipped with filler cap, air inlet valve, pressure gauge, relief valve, automatic shut-off valve within the tank, dispensing hose and control valve. The Superdraulic feeder-bleeder unit is capable of operating efficiently at a temperature range of from minus 65° to plus 130° and is proof-pressure tested at 300 psi., according to the manufacturer.

## Purifies Crude for Use as Diesel Fuel

A Sharples continuous centrifuge used with a unique fuel storage method, makes it possible to purify pipe line crude oil for use as a fuel in pumping station diesel engines. The non cratering purified fuel is free fo dirt, tank scale and moisture and is not re-contaminated in storage. Installations now in operation are sucessfully processing crude from the oil fields of Texas, California, Illinois, Louisiana, Wyoming and Canada, and the purified fuels are being used in a number of different types of medium speed diesel engines.

The continuous centrifuge, the heart of the Sharples System is powered by a two horsepower motor and is almost completely automatic, requiring only a fifteen minute cleaning once a week. All safety requirements for pumping operation are met by the fireproof and explosive proof construction of the unit. Actual station data shows that the total quantity of pipe line crude required to supply pumping station engines usually falls within the shrinkage allowance of the station. A complete description, specifications, flow diagrams and illustrations are contained in Bulletin #1266 which can be obtained on request from the Sharples Corporation, 2300 Westmoreland Street, Philadelphia 40, Pennsylvania.

This "Tough Trencher"
Speeds "Big Inchers"
The Cleveland Trencher combines advanced engineering principles with tougher materials and lighter weight to speed up and increase the variety of its trenching operations. ROCKFORD CLUTCHES and POWER TAKE-OFFS contribute to this modernizing development. Let ROCKFORD clutch engineers help improve the power transmission control in your construction machines.
ROCKFORD CLUTCH DIVISION
B-W ENGINEERING MAKES IT WORK
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## Announces Autonomous Division Operation

Gordon R. Anderson

W. H. Kingsley

Mr. Robert H. Morse, Jr., president of Fairbanks, Morse & Co., Chicago manufacturers, has announced an autonomous operation for two of the company's divisions, Scale and Electrical. Gordon R. Anderson, who has for a number of years been works manager of the company's Freeport, Illinois, plant where electrical products are manufactured, has been prmoted to the position of general managr of the Electrical Division of the company. Mr. W. H. Kingsley is sales manager of the company's Electrical Division. Both Mr. Anderson and Mr. Kingsley have their headquarters at the Freeport plant of the company.

George C. Worthley

J. S. Peterson

The Scale Division will be headed up by George C. Worthley who has been with the company since 1914 and who has now been promoted from sales manager to general manager of this division. Joe S. Peterson succeeds Mr. Worthley as sales manager of the Scale Division.

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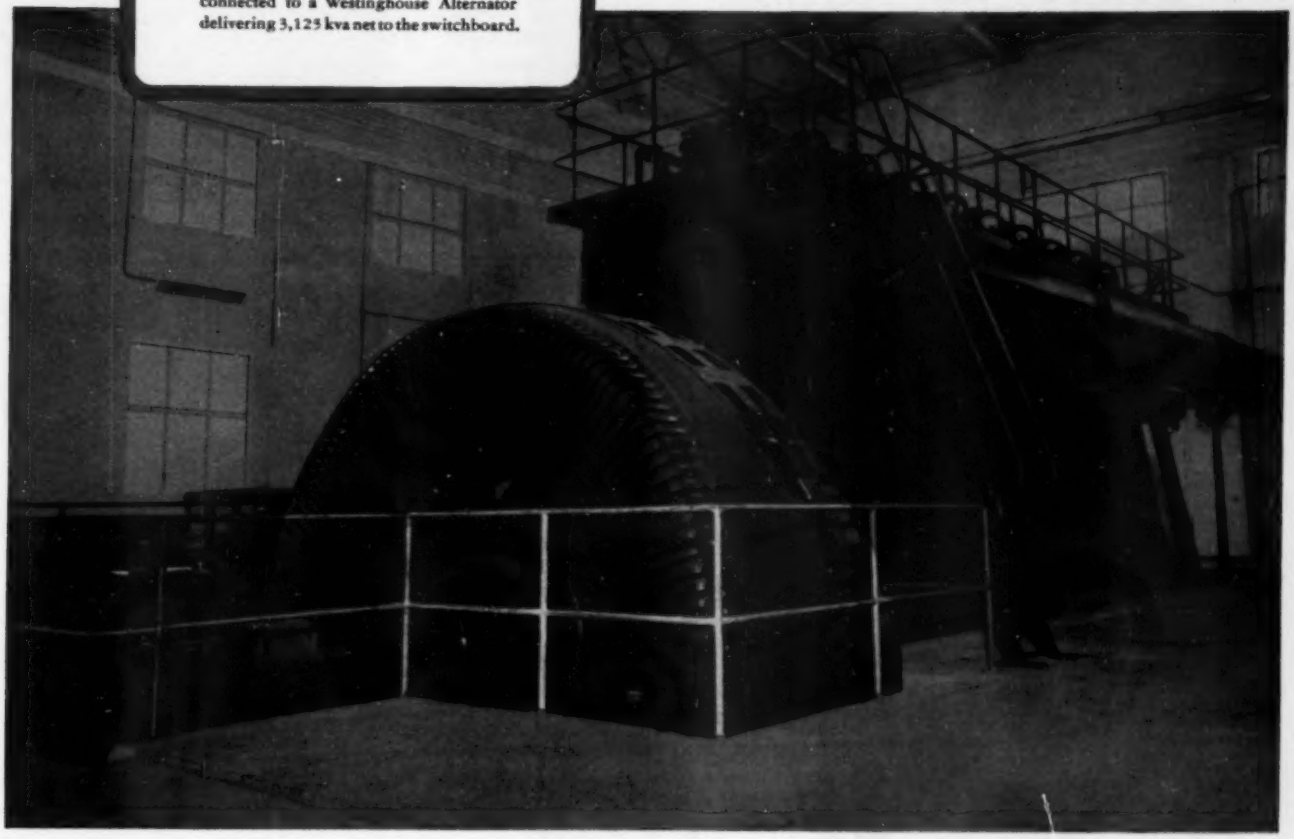
This is the first American-made engine generator unit installed at the power plant of the Bermuda Electric Light Co., Ltd. The Nordberg Diesel Engine is direct-connected to a Westinghouse Alternator delivering 3,125 kva net to the switchboard.



# This generator unit turned the tide at Bermuda

Here is the first American generator unit installed at the Bermuda Electric Light Co., Ltd. Prior to 1939, all the generating units were of British make. This unit changed the pattern . . . consisted of a Westinghouse Generator and a Nordberg Diesel Engine. The outstanding performance of this unit was responsible for another similar installation in 1950.

Westinghouse Generators create such acceptance because of their reliability—long life—performance. Once you specify Westinghouse you'll always specify Westinghouse. Take the fabricated steel rotor . . . it has been designed with such a high factor of safety that it is practically unbreakable. The all-steel frame makes possible a stator assembly having maximum strength and the permanent tightness of core that is necessary for a quiet, smooth-running machine. Electrical efficiency is tops, too . . . materials are so proportioned that the maximum efficiency of conversion is obtained from three-quarters to full load.

Call your Westinghouse Power Apparatus Specialist for complete consultation on your generator installations. He will work with you on the design, selection and application of the right equipment. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-10362

## Sales Engineers Honored

Ten sales engineers representing distributors of the Detroit Diesel Engine Division of General Motors have been named leaders in the sale of GM diesel engines in their respective zones for 1951. As winners of the annual W. T. Crowe award the men were brought to Detroit by the Division on March 13 where each was presented with a certificate of merit and a ring. The presentations were made by W. T. Crowe, general manager of the Division at a dinner commemorating the occasion.

The men honored and the companies they represent in the industrial, construction, petroleum and marine fields throughout the country were announced by Detroit Diesel's sales manager V. C. Genn, as follows: Vincent C. Giuliano, Griffin Equipment Corporation, New York, New York; Jules J. Janssen, Highway Equipment Company, Pittsburgh, Pennsyvania; Lee Hardiman, Florida Diesel Engine Sales, Jacksonville, Florida; Herbert S. Matthews, George Engine Company, Harvey, Louisiana. Others were Robert Sime, Borchert-Ingersoll, Inc., St. Paul, Minnesota; Robert Bowles, Jr., Western Machinery & Engine Company, St. Louis, Missouri; King D. Boyd, Stewart & Stevenson Services, Inc., Houston, Texas; George A. Hefty, Mountain Tractor Company, Missoula, Montana; Robert J. Hines, Anderson-O'Brien Company, Los Angeles, California; and Walter W. Brydges, Evans Engine & Equipment Company, Seattle, Wash.

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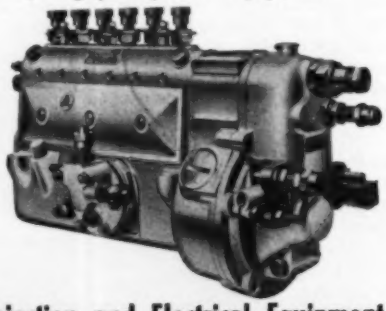

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## Named to Boston Works

Assignment of James C. Barnett, N. William Morelli and E. Robert Perry as assistant engineers at Allis-Chalmers Boston Works has been announced by L. W. Long, general manager of the works. All three of the men recently completed Allis-Chalmers graduate training course. Mr. Barnett and Mr. Perry are electrical engineers, the former a graduate of Texas State A & M College and the latter of Texas A & I College. Both men are student members of the American Institute of Electrical Engineers. Mr. Morelli is a mechanical engineering graduate of Oregon State College and a student member of the American Society of Mechanical Engineers.

## Capital Transit Buys 92 Busses

The White Motor Company has received an order from Capital Transit Co., Washington, D.C., for 92 fifty-passenger diesel busses, it was announced by Robert F. Black, president. The order totals approximately $2,000,000 Delivery of the units is scheduled to start in May at the rate of ten per week. The White diesel coaches, five feet longer and six inches wider than busses now in service in Washington, D.C., will be used on three routes—Connecticut Avenue, Benning Road and Sixteenth St., N.W. Capital Transit has had approval from the District of Columbia Commissioners to operate larger-capacity busses on these routes.

The new models feature some of the latest developments in transit units engineered to provide efficient and economical service. Two driving features incorporated in these diesel coaches are power steering and automatic transmission which add new safety, maneuverability and driving ease. A new all-weather ventilating system of much larger capacity employing anemostat distribution is also an important advantage introduced in these new White coaches. Another feature which is important in this model is improved visibility for both driver and passengers. Driver vision has been substantially improved in all directions for added safety. New styling features include extra-size destination signs and harmonious interior and exterior decoration in keeping with Capital's longstanding reputation for pleasing color styling. The new 50-passenger diesel units are 39 feet 5½ inches in overall length and 102 inches wide, these new dimensions not only permitting additional passenger capacity but more comfortable seating arrangement.

## New York Branch Wins Annual Award

**Presentation of the Colonel Robert H. Morse Cup to the New York branch sales organization. Here the Colonel, who is Chairman of the Board of Fairbanks, Morse & Co., and after whom the beautiful trophy is named, personally presents the cup to T. W. Drennen, New York manager. Others in the photo, from left to right: Robert H. Morse, Jr., president of the company; C. N. Knauer, honor field engineer of New York branch; J. A. Cuneo, general sales manager; Henry J. Barbour, manager, sales promotion and public relations; and O. O. Lewis, vice-president—sales.**

A new silver trophy for top sales performance in 1951 was presented to T. W. Drennen, manager of the New York branch of Fairbanks, Morse & Co., Chicago manufacturers of diesel engines, locomotives, electric machinery, pumps and scales, recently at a special dinner given in the Starlight Ballroom of the Waldorf-Astoria Hotel. The new Fairbanks-Morse cup, called the Colonel Robert H. Morse Cup in honor of Colonel Morse, chairman of the board, was presented by the Colonel himself to Mr. Drennen and the New York sales organization. About 150 participated in the gala event. Nineteen years ago Colonel Morse first awarded a trophy called the President's Cup to the company's branch house which enjoyed the largest volume of sales in relation to its annual quota. During this period of time the President's Cup traveled from coast to coast and to Mexico City.

The New York Branch won the coveted trophy four times and the President's Cup became so covered with the names of the winners engraved thereon, it became necessary to offer the new cup, called the Colonel Robert H. Morse Cup. The company's New York Branch was the first to receive the new award. Charles Knauer topped the group of New York Field Engineers and, accordingly, his name is inscribed on the cup alongside that of Manager Drennen's. In addition to Colonel Morse, others present from the Chicago executive office were: Robert H. Morse, Jr., president; O. O. Lewis, vice-president—sales; L. W. Stolte, vice-president and treasurer; J. A. Cuneo, general sales manager; and Henry J. Barbour, manager, sales promotion and public relations. Also present were G. R. Wyer, vice-president, The Canadian Fairbanks-Morse Company, Limited, Montreal, Canada; A. L. Decker, vice-president, The Buchen Company, Advertising Counselors, Chicago. Several of the company's branch and sub-branch managers attended, among whom were R. A. Stevens, Boston; F. J. Lindauer, Washington, D. C.; Carl W. Linscheid, Export Division; Robert W. Perry, Philadelphia; and J. C. Rhea, Baltimore.

**DIESEL ENGINE CATALOG is now available in its Sixteenth expanded edition. Completely revised and re-edited, it is an invaluable aid to design engineers and buyers. Fully illustrated. $10.00. Order now from DIESEL PROGRESS, P.O. Box 8458, Cole Station, Los Angeles 46, California.**


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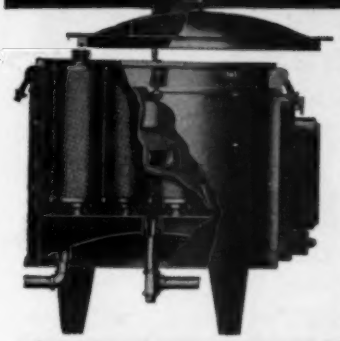

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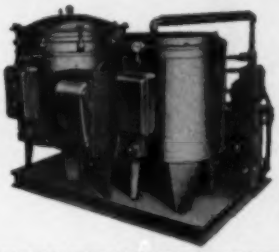

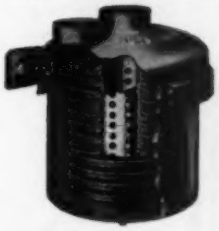

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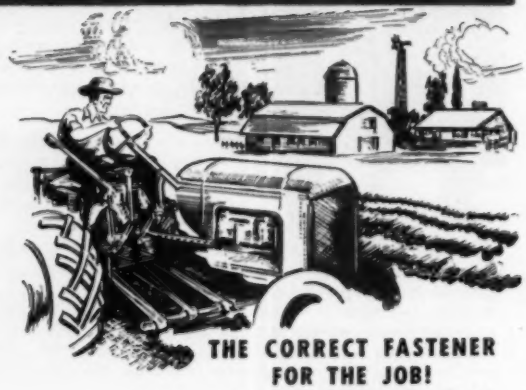

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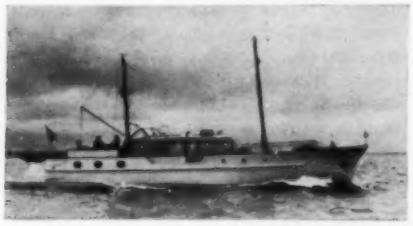
## Florida Diesel News

*By* ED DENNIS

*INCO TRADER* of Tampa had a new Cummins diesel installed, with a Century dc. 60 kw. generator. This ship runs between Tampa and South American ports. Tampa branch of Cummins Diesel of Florida sold and engineered the installation.

AT THE ORANGE State Show we saw a set of 2 G.M. 6-71's with 2 Delco 60 kw. generators, Yocam H.D. 12 volt batteries, Simplex voltage regulator and Luber-finer lube oil filters. They used Standard #2 fuel oil and #30 H.D. lube oil. Only one overhaul and the hour meters revealed over 120,000 hours. Lewis Supply and Diesel Co. of Memphis, Tenn., mounted this installation on the truck.

AT EVERGLADES CITY Light and Power Co. we saw 3 Fairbanks Morse generating sets, a 160 kw. and a 120 kw. with F.M. generators along with a 200 kw. which has a Woodward governor. This plant also supplies current to the water works and a 20 ton ice plant. Gulf lube oil is used and the Belcher fuel oil is trucked across the Everglades from the East Coast by a Cummins dieselized White truck.



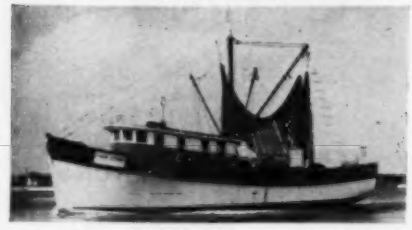
RECENT ARRIVALS in New Orleans are the first of a series of Dutch built yacht hulls. All of these ships will be furnished with American diesel engines and American built marine accessories according to Herbert Hayes, president of Feadships Inc., Miami. The *Caprice*, size 55-ft. by 13-ft., has been powered with 2 Hercules 6 cylinder diesels at the Miami Beach Boat Slips. It has a Groco cooling system and Paragon clutches, Auto-Lite starters, generators and batteries with 22x20 props. Mr. Fred Richman, her proud owner, cruises at 9 knots. Richman is president of Florida Drum Co. Inc., who are the distributors for Hercules Diesel engines in the Pensacola area.

FROM PORT EVERGLADES for Miami International Airport, 6500 barrels of aviation gasoline in the Belcher barge #11 being towed by the tug *L. R. Hisey* of Belcher Towing Co. A D315 Caterpillar with a Twin Disk clutch and Viking pump on the barge and a model D375 Caterpillar with a Twin Disk clutch and Snow Nabstedt reduction gears on the *Hisey*, skippered by Tony Diaz. Over 2 million gallons of aviation gas is delivered to this airport by Belcher Oil Co. each month via barge.

FEADSHIPS of Miami reports a steel 40x9x3 Commuter cruiser with a 200 hp. G.M. 6-71 and a top speed of 22 knots, sold to John W. Mecome to be used out of Houston, Texas to the oil well rigs off the coast; also a 71-ft. steel cruiser 110 G.M. and

an 81-ft. steel cruiser with 4 G.M. 6-71's to other interests.

THE SHRIMPER *Camarones* is the first of the new shrimp fleet to be operated out of Miami by the Wells Bowers Co.



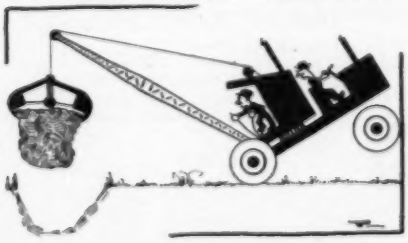
THE *Fair Star* is a 67x18 Tams designed shrimp trawler and built by Diesel Engines Sales Co. at St. Augustine, Fla. It is powered with one of the first D-337 Caterpillar diesels to be used in a marine installation. Owned by C. B. Faidley of Jacksonville and now fishing off the Campeche, Mexico grounds, it has proven itself to be tops in its trade. Diesel Engine Sales Co. Inc., "Builders of the World's Finest Shrimp Vessels" is one of the largest firms of this type in the country and is capable of producing one complete package trawler each week.

WE SAW THE 99x20x4½ tunnel stern yacht *Siesta* cruising at about 9 knots through Government Cut, a G.M. 6-71 165 hp. engine with a Kurz and Root 3 kw. generator hooked to a power take-off; a lot of ship for a small engine. Costs about a dollar an hour to run this yacht. Has a 4 cylinder Hercules 7 kw. generating set. Capt. Ed. Price is the skipper.

AT THE MEETING of the newly organized Florida Marine Association the elected officers were Tom Waring of Tampa, president; Tom Laseter of Jacksonville and Capt. Edwin P. LeMay of Miami, vice presidents; and Robert Thomson of Miami, secretary-treasurer. It was noted that Florida marine industries are a $62,000,000 a year operation and that the state is the fourth largest producer of marine products in the U.S.

## On "All Round" Bearings

"Facts Illustrated," now being distributed by the Dura-Bond Bearing Company, clearly portrays in text and pictures the differences between the so-called "all round" camshaft bearing and its counterparts, the split and interlock types. Covered in this free booklet are such items as the differences in precision, methods of manufacture, profit comparison, and other subjects. "Facts Illustrated" is available from the Dura-Bond Bearing Company, 715 Loma Verde Avenue, Palo Alto, California.

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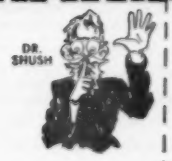


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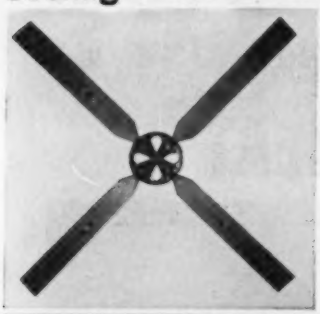

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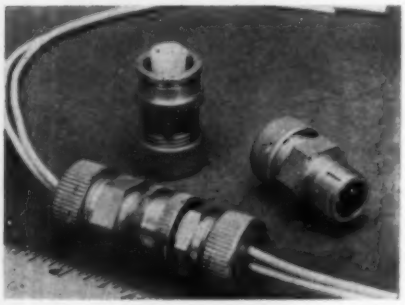
### Acquires New Division

Acquisition of Petroleum Accessories, Inc., of Detroit, manufacturers of large capacity fuel filters used extensively in the handling of aviation fuels, was announced recently by Ralph R. Layte, president, Purolator Products, Inc., manufacturers of Micronic automotive oil filters and other filtration equipment. The acquisition, Mr. Layte pointed out, will broaden the Purolator line and add to production facilities as well. Equipment is now being moved from Detroit to the Purolator plant at Rington, Pa., where the operation will add substantially to employment in that area. Petroleum Accessories, Inc., which for the present will be operated as a division of Purolator, Mr. Layte said, was acquired through an exchange of stock. Roland Burks, former president, will remain with Purolator with headquarters in its Detroit sales office. Darnell Burks, his brother and co-owner, will move to Ringtown to head manufacturing operations on the PA filters there.

### Lightweight Electrical Connectors



Titeflex, Inc., Newark, N. J. announces the marketing of a complete line of new lightweight electrical connectors, originally developed by the Salsbury Corporation, Los Angeles, California. Titeflex will now be the only company to manufacture and market this new type connector. Designed to meet special requirements of temperature, corrosion, and vibration that no other standard connector could solve, it is now available for general use on all electrical equipment. The Titeflex connector will be furnished in 17 shell sizes, conforming to AN sizes 8-36 inclusive and can be furnished for cord connections, shielded assemblies, and bulkhead or box mountings.

This new lightweight connector introduces an unusual method of assembly that allows for unlimited wiring arrangements. Its unique design eliminates clamps, saves space, facilitates harness assembly, and permits easy changes in wiring arrangements. In assembly, a major production advantage is that the terminals can be removed from the block to solder or crimp the wire or wires to the end of the terminal and thus eliminate the difficulty of making a connection in the confined space of the connector shell. This method also eliminates the problem of twisting slack wire into the connector upon completing the assembly. The basic designs have been developed so that the Titeflex connector can be used for all AN applications and still retain its high performance characteristics. General and broad applications will be in the aviation, marine, industrial and communications fields.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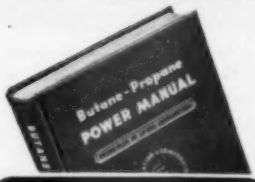


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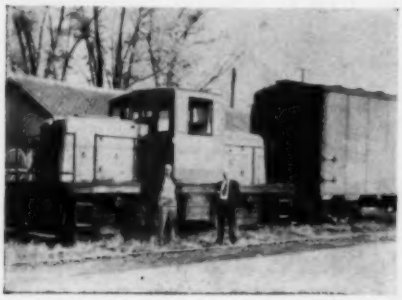


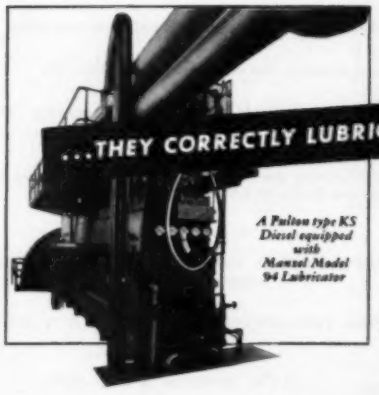
Operating cost reductions of 87.5 per cent have enabled an Indiana short-line railroad to replace its 31-year-old steam locomotive with a new 45-ton General Electric diesel electric. The new locomotive is now in operation on the Louisville, New Albany and Corydon Railroad. It makes daily round trips between Corydon and Corydon Junction, 7.7 miles away. Although the railroad grosses less in one year than the cost of the new locomotive, William Buchanan, president-owner of the line, points out that the G-E diesel electric will pay for itself in less than seven years.

An annual return of 14.6 per cent is expected on the capital investment of the new locomotive. Most of this is a result of a saving of $5,600 a year in operating and maintenance expense compared to similar yearly expenses of the old steam locomotive. Man factured products, lumber, petroleum and farm products make up most of the tonnage carried by the line from Corydon to the Junction where it meets the Southern Railway System. Mr. Buchanan says that the standard G-E 300-hp. switcher can haul 325 gross tons on the line's south run. Because of severe grades on the return trip, the locomotive pulls a maximum of 193 gross tons.

## New Cummins Dealer Welcomed

The oldest and newest Cummins Dealers meet. On hand to welcome Raymond H. Snyder, right, into the Cummins Dealership organization, were, left, R. P. Meehan, Watson & Meehan, San Francisco, who heads one of the oldest Cummins Dealerships, and center, L. W. Beck, vice president-Sales, Cumins Engine Company, Inc., Columbus, Indiana. The scene of the meeting was at the Cummins factory. Mr. Snyder recently purchased certain assets of the Chicago operation of Cummins Diesel Sales Corporation and will operate these facilities as an independently owned Cummins dealership. The new company name is Cummins Illinois Engine Sales, Inc., with headquarters at 1700 South Indiana Avenue, Chicago.


LEADING DIESEL ENGINES HAVE *Manzel* FORCE FEED LUBRICATORS

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*Write for Bulletin 316*

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Special Cast Iron Housing and Top Only 4 Bolts
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## Inland River Reports

*By* DAVID I. DAY

THE *NACCO* of the Powhatan Mining Co. fleet of Powhatan, O., in 11 years has had four owners and four names. When she came forth in 1940 from the Sturgeon Bay yards she was the *Frog* flying the flag of the Lea River Lines. In succession she became the *Wheeling* for the Wheeling Steel Corp., the *Corsair* of the Campbell Barge Line and now with a new name and a new owner. Nevertheless, this 65 x 24 pusher is a good one for her size and uses twin Superior engines totaling 640 hp.

WE NOTED recently the two sister tugs up the Ohio from Brownsville, Texas, down on the Rio Grande headed with manganese ore for the Union Carbide & Carbon Corp., and both were moving swiftly on high water. These tugs are the *Dixie* and *Dauntless*, each with 1320 hp. from single Superior diesels, doing fine work on river and canal for C. J. Dick Towing Co., Houston, Texas.

The *CAMILLA H*, formerly of the Walter G. Hougland fleet of Paducah, Ky., now of the Chemical Barge Line, Wilmington, Del., was equipped recently with RCA radio and other items at the St. Louis Ship and is back at work. She has Cooper-Bessemers.

THE 148-FT. *Marco* of Martin Oil Service, Inc., Chicago is being repaired and will shortly be back in service on the Illinois River. The fire which originated in the laundry room did about $10,000 damages some time ago near Ottawa, Ill. Fortunate, the two barges of gasoline in tow were not ignited nor was the engine room in any way impaired. This boat was once called the *Progress* and operated for the American Barge Line. She has twin Cooper-Bessemer diesels of 2000 hp. total.

REPORTS FROM Marietta, Ohio, and other points on the upper Ohio express pleasure at seeing the neat *Sturgeon Bay Queen* in those waters in February towing oil. She is owned by theMid-Continent Barge Line and is propelled by a single Fairbanks-Morse engine rated at 1400 hp.

THE POPULAR *Frank C. Rand* is back at work with new twin propellers and a new Kort Nozzle from Dravo Shipyards, Neville Island, near Pittsburgh. This 2000 hp. boat is regarded as more nearly a 2500 hp. craft by rivermen. She has Superior engines. Owned by the Mississippi Valley Barge Line, the *Rand* was perhaps the busiest boat on the upper Ohio in 1951.

JONES & LAUGHLIN Steel Corporation, Pittsburgh, is evidently discarding all steamboats. The company has ordered three more diesel vessels from the St. Louis Shipbuilding & Steel Company. Each will be twin screw, each 108 x 27 in size, each to have 1400 hp. from Superior engines.

THE NEW Avondale-built M.V. *Frank W. Banta* was seen pushing gasoline in late February up the Kanawha River. Owned by Plaquemine Towing Co., the boat has twin G-M engines, 1800 hp.

UNDER TITLE "Signs of The Times," we have a nice letter from J. W. O'Haver, Pittsburgh, saying: "The old steamboat *Aliquippa* built back in 1914 is being dismantled. I think the *B. F. Jones, Jr.*, will be converted to diesel. The Jones & Laughlin firm has tried steam power and learned it cannot compete."

THE MOST IMPOSING tow of steel products we have seen this winter was coming down the river a short time ago. It was 11 big barges, loaded very heavily, pushed by the *Pennsylvania* of the Union Barge Line, Pittsburgh. This motor vessel, 166 x 36 x 10.5 was built by Dravo in 1947, has Kort Nozzles boosting the power to possibly 2800 hp. The twin engines are Superiors.

THE POPLAR RIDGE COAL COMPANY, Caseyville, Ky., is in possession of 12 new 195-ft. integrated steel coal barges from Dravo and will use ville, Ky., is in possession of 12 new 195-ft. integrated steel coal barges from Dravo and will use them in coal trade with St. Louis. It is said the *Inca* will be the first towboat in use. Only 90 x 30 x 8, this vessel has twin Superiors with 1800 hp.

NO BOAT NOTED in January was more useful to the river shippers below Pittsburgh than the Union Barge Line's *Reliance*, 2000 hp., with Kort Nozzles and Superior twin engines. For a considerable distance, it seemed every time we drove around a river bend the *Reliance* was either coming or going with nice tows. She is Dravo-built.


# MAJOR OIL PRODUCER GOES 100% VAPOR PHASE

**Reduces Operating Costs to New Low—Solves Power, Pumping and Heating Problems**

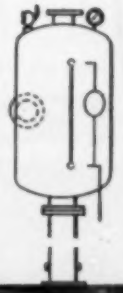
Multi-purpose Vapor Phase started a *revolution* in oil field operations, back in May 1950, when a major West Coast producer Vapor Phase equipped a Kobe Lifting Oil 11 engine Pumping System. For a year and a half they gave it "the works." The record was sensational!

So, in December 1951, two more Kobe pumping plants were Vapor Phase equipped—

—and, in March 1952 in this same field, a Vapor Phase equipped Ingersoll-Rand 1650 HP Gas Engine Compressor Station was placed in operation.

In the Kobe System, illustrated below, Vapor Phase serves three vital functions *for the cost of engine operation only*:

1. Keeps a battery of 11 Twin City HUA Gas Engines (500 HP) at constant peak efficiency, with lowest fuel and lube oil consumption, and unaffected by ambient temperatures or conditions. 2. Provides steam at 10 psi 240°F.—1500 pph or 1,429,500 btu's per hour at full load—used to heat the Kobe System lifting oil. (Kobe oil at 3500 psi passes through heat exchanger tubes heated by steam. Condensate is automatically collected in hot well for return to Vapor Phase unit without loss.) 3. Eliminates costly cooling tower formerly used.



In addition to oil field operations, Vapor Phase now serves in pipeline pumping stations, gasoline plants, refineries, engine generating plants, etc., internationally.

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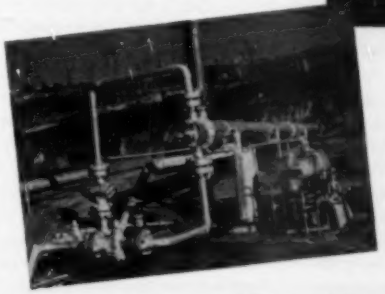
Vapor Phase equipped engines are used to generate electric power, generate steam, heat water, fluids, space and other process (including cooling and heating via air-conditioning systems) —each as required or all at the same time *for the cost of engine operation only*.

*The single Vapor Phase unit, pictured above, replaced the costly cooling tower shown—keeps the eleven engines, at right, at constant peak efficiency—and serves the heat exchanger and condensate hot well shown below.*



*Regardless of operating requirements, ANY old or new Diesel, Gasoline or Gas engine powered generating plant may be Vapor Phase equipped quickly, efficiently and at surprisingly low cost. Vapor Phase functions automatically and pays off in savings alone the first year.*

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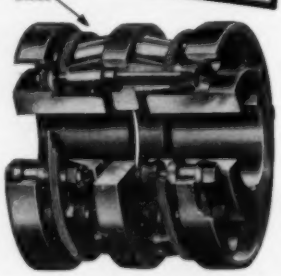

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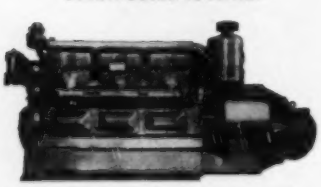

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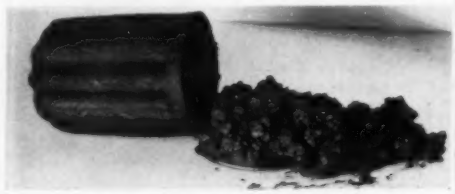
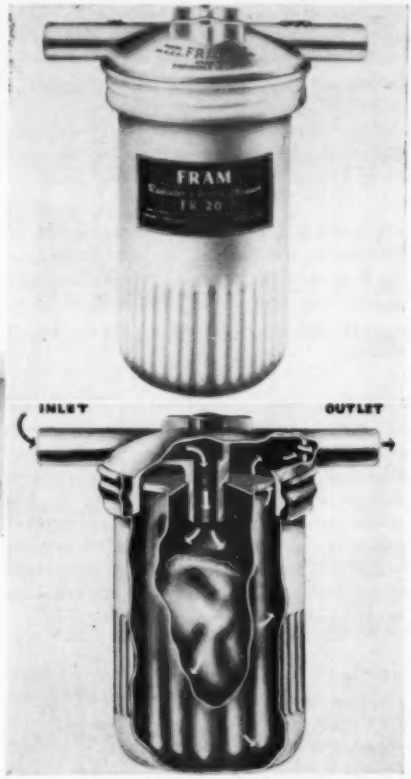
# RADIATOR AND WATER CLEANER

THE Fram Corporation, one of the world's leading manufacturers of oil, air, fuel, and water filters, has developed a new radiator and water cleaner designed to prevent cooling system troubles.

The Fram radiator and water cleaner is the result of many years of research and engineering development both in the Fram laboratories and on the highways. Fram engineers report that they had received numerous inquiries and requests for a filter that would eliminate the major causes of engine overheating. These requests came from motorists, fleet and bus operators, and others who help to make up the $100,000,000 spent annually on cooling system troubles. After extensive research and testing the Fram Corporation introduced their radiator and water cleaner.

The new Fram radiator and water cleaner has a triple-action. It filters, softens and inhibits. Two-thirds of the nation's water is hard, containing minerals that form deposits in water jackets and act as insulators. These deposits keep the heat sealed in






***Top*—Expended cartridge from a Fram radiator and water cleaner showing the rust, scale and dirt from an average cooling system. *Right*—Cutaway view showing how the water and radiator cleaner works.**

. . . prevent it from being carried away by the coolant. Flaking scale deposits can close the narrow radiator passages and foul thermostats. The new Fram radiator and water cleaner softens hard water and thus prevents scale deposits. The cooling system must be kept free also of corrosion and rust. Untreated water in contact with cylinder blocks, heads, and radiator cores causes rust and corrosion. This eats away the surfaces of vital parts, forms particles that plug radiator passages. Corrosion can eat through internal parts and cause serious leakage. The new Fram radiator and water cleaner inhibits corrosion and prevents rust. It also preserves metal surfaces. A rusty, scaly cooling system can cause troubles that may end in scored pistons and cylinders, burned valves, warped valve seats, cracked cylinder blocks and heads, plus needless loss of time and money.

Typical of the many reports received by the engineering department is this letter from a leading Canadian fleet operator. "We would like to draw to your attention our experience with your FR 20-1 radiator and water filter. On July 23, 1951, we had a report from our driver re over-heating of an International KB8 cooling system, at 82,490 miles. The truck was being serviced at the time in preparation for a trip from London, Ontario, to Halifax, Nova Scotia, and return. We attempted to have the truck radiator and block cleaned and back-flushed by the Bl— system, but found that it was not possible to have this done without disrupting our schedule. We installed a Fram radiator filter as an expedient to keep the truck on schedule and to avoid further overheating, if possible.

"Upon the return of the truck from Halifax, we removed the filter element for examination and found it almost completely full of rust and scale. Upon examination, we found the radiator filter neck was free from rust. The driver reported that the trip was made without incident and that the temperature gradually returned to normal. A new filter element was put in at this time after 85,755 miles on August 13th and was removed on September 11th at 90,130 miles for a routine check. The element was found to be about three parts full of rust and was discarded. At both times of element changing, the filter body was hot, indicating that the filter was still capable of trapping further sediment. In view of the results obtained from this one truck, we have decided to equip our entire fleet with Fram radiator filters and are installing them as fast as possible. We fully believe that your filter will more than pay for itself by avoiding lost time due to cooling system troubles, with resultant expense."

For more complete details and information on the Fram radiator and water cleaner, write DIESEL PROGRESS, File 96, P.O. Box 8458, Cole Station, Los Angeles 46, Calif.

### Butane-Propane "Power Manual"

The new Butane-Propane "Power Manual" gives step-by-step directions for converting gasoline engines to butane-propane carburetion—a field which last year saw 100,000 installations in tractor truck, bus, taxi, auto and industrial engines. It has the complete story of LP gas carburetion principles and equipment—from the tools needed to sales hints for getting and handling this profitable business. The 330-page "Power Manual" is written in everyday language, its six sections and 23 chapters cover the basic facts of fuel and power, carburetion, conversion, service adjustments, maintenance and trouble shooting, how to sell LP gas carburetion.

Over 40 leading manufacturers of quality equipment cooperated with the author, Carl Abell, nationally known writer and lecturer on automotive subjects and now an editor of Butane-Propane News. Much of his material is appearing in print for the first time and the generous use of photographs, diagrams and engineering drawings make it easy to follow the instructions outlined in the manual. Designed for on-the-job use by mechanics and servicemen, the "Power Manual" has a completely referenced cross-index. It is bound in flexible plastic and fits into a coat pocket. $3.50 each, postpaid. Copies can be obtained from DIESEL PROGRESS, P.O. Box 8458, Cole Station, Los Angeles 46, California.

### Named to Advisory Board

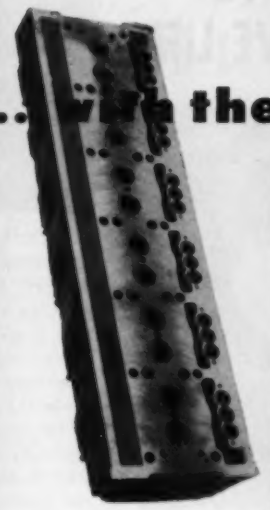
Harold H. Lurie

Harold H. Lurie, chief metallurgist, Cummins Engine Company, Inc., at Columbus, Indiana, has been named a member of a six man Metallurgical Advisory Board to assist the United States Navy on a special technical project. Mr. Lurie's appointment was announced by W. H. Eiseman, secretary, American Society for Metals, with headquarters at Cleveland, Ohio, and confirmed by D. J. Cummins, Cummins' vice-president—Engineering. The society has more than 20,000 members. A 1923 chemical engineering graduate of the University of Illinois, Mr. Lurie holds a master's degree from Purdue University. Before joining Cummins Engine Company in 1939, he was chief metallurgist for Ross Gear & Tool Company, Lafayette, Indiana. For a number of years, he was a research associate at Purdue University's Engineering Experiment Station. Mr. Lurie has been a member of the American Society for Metals since 1923. In 1941 he was chairman of the Society's Indianapolis chapter.

### District Manager

Mr. H. F. King, Socony-Vacuum Oil Company, Inc., has been appointed industrial district manager of the company's New England Division, Boston. Mr. King was formerly district industrial sales supervisor in St. Louis. In his new duties he replaced Mr. J. C. Dean who has been transferred to the company's New York office, 26 Broadway, as industrial division manager, lubricating department.


**Rebuilt diesel castings... with the Guth FUSION* PROCESS**



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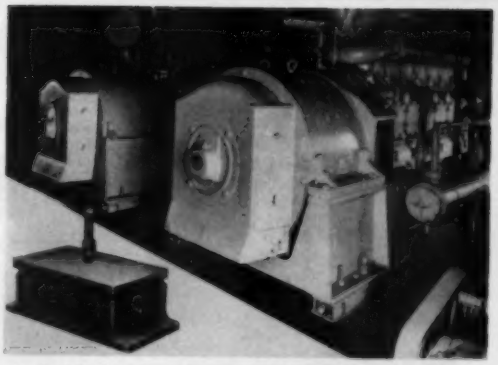
**Current installation practice is to mount them on Korfund Vibro-Isolators.**

**This makes it possible to install diesels *anywhere* with positive assurance that there will be absolutely no transmission of objectionable vibration. Additional benefits include savings from reduction of building and engine maintenance costs, and frequently the elimination of concrete foundations.**



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Namm Department Store, Brooklyn
4 300-hp.; 1 180-hp.; 1 150-hp. Worthington
Macy's, New York ..... 1 700-hp. Alco
Floyd Bennett Field, New York ..... 1 450-hp. Fairbanks-Morse
Prudential Insurance Co., Newark, N. J. ..... 1 740-hp. Baldwin
Lone Star Gas Co., Dallas, Texas ..... 1 400-hp. Cooper-Bessemer (Gas)
Sun Oil Co., Marcus Hook, Pa. ..... 4 250-hp. Ingersoll-Rand (Gas)
Cia Central Argentina De Electricidad, Buenos Aires, S. A.
1 270-hp. Sulzer; 2 540-hp.; 1 540-hp.; 1 700-hp. Deutz

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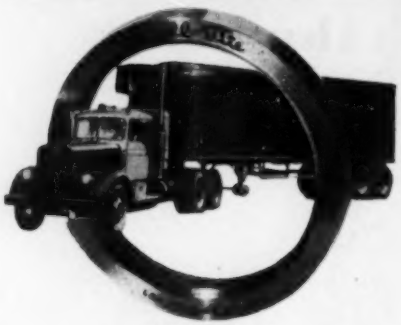

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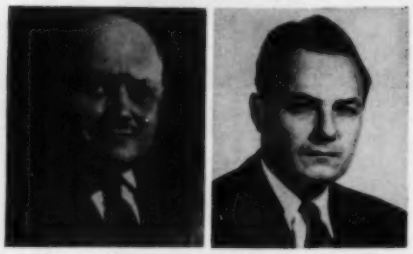
## Announces Expansion Program



John H. Sheusner — Leonard O. Mjolsnes

P. I. Birchard, vice-president and general manager, Enterprise Engine & Machinery Company, of San Francisco, announces an expansion program. This West Coast manufacturing division of General Metals Corporation produces a complete line of diesel engines for marine and stationary use. Also produced by the company are industrial oil burners and food processing equipment. To meet the needs of expanding sales, former chief engineer, John H. Sheusner, becomes head of Engineering and Manufacturing. Replacing Mr. Sheusner as chief engineer is Leonard O. Mjolsnes who will continue the design and development work fostered by the company. New sales personnel in the diesel engine division include Ray Hogaboom, new district manager of the Los Angeles branch, with Charles Carmichael, sales engineer, added to the branch office staff in Chicago. Dennis J. O'Leary and Stuart F. Atsatt are new sales engineers serving the industry from the San Francisco office.

## Chicago District Manager

The Diamond Chain Company, Inc., of Indianapolis, Indiana, manufacturer of roller chains, sprockets and flexible shaft couplings have announced the appointment of D. G. Viskniskki as their Chicago district representative. This appointment followed the retirement of S. C. Hurley.

## Fast Service

Mobile phones installed in two of Cummins Diesel Sales of Oregon, Inc.'s, new service trucks have speeded up calls to Cummins users in remote areas. In the illustration above D. Douglas, Cummins serviceman, gets ready to call Portland headquarters for a new assignment after completion of a service call at an Oregon lumber camp.

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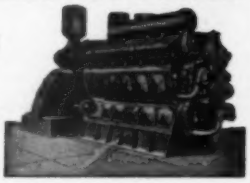

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## Director of Sales for EMD

Paul R. Turner

Promotion of Paul R. Turner from eastern regional manager to director of sales of Electro-Motive Division has been announced by Nelson C. Dezendorf, vice president of General Motors and general manager of Electro-Motive. Mr. Turner succeeds Mr. Dezendorf, who recently was made general manager of Electro-Motive, builder of General Motors Diesel locomotives. Mr. Turner has been with Electro-Motive since its inception in Cleveland in 1922, resigning from the White Motor Truck Company to become associated with H. L. Hamilton in the founding of the Electro-Motive Engineering Company. Born in Milan, Ohio, March 29, 1894, Mr. Turner received his early education in the Milan public schools, and then moved to Cleveland where he was graduated from University School in 1915.

He joined the White Motor Truck Company in 1918 and served in its national sales department until 1921. It was while establishing branch offices in Denver and Salt Lake City that Mr. Turner became associated with Mr. Hamilton, then wholesale sales manager for White, and the two men started the preliminary planning that led to establishment of Electro-Motive. In 1925, Mr. Turner established the first Electro-Motive office in New York City. He remained in New York directing the expanding sales activities for Electro-Motive in the eastern half of the United States. Mr. Turner is a member of the Westchester Country Club at Rye, N. Y., the Cloud Club of New York, and president of the General Motors Club of New York. He is a director of the Peoples National Bank and Trust Company at White Pains, N. Y., where he has made his home. He is married and has two daughters, Barbara and Helen.

---

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## West Coast Diesel News

*By* FRED M. BURT

SUPPLIED AND installed by Shore Line Diesel Maintenance Co., Fishermen's Wharf, San Francisco, new General Motors 2-71 diesel for 30-ft. crab boat *Scafani Bros.*; GM 6-71 with 2:1 GM reduction gear to power 34-ft. combination boat under construction at Sausalito Boat Works for Nuncio and Dominic Fruciano.

RECENT PERSONNEL changes by Shepherd Marine (formerly Shepherd Diesel Marine) of Los Angeles and San Diego; Webb Hunt appointed sales manager at San Diego, Roger Sloan is new store manager.

THREE NEW dealers in Washington for Witte diesel power units and diesel electric plants, appointed by Megorden Machinery Co., Clearwater, Wash., distributors, are—Robert M. Ruby, Bellingham; Lester Northrup, Port Angeles; and Don Bidwell of Diesel Engineering, Seattle.

IN LATE FEBRUARY, the Johnson Line's new 19 knot, 500 ft. 9,000-ton capacity motorship power with twin Great M.A.N. diesels (14,000 total hp. at 110-rpm.), on her maiden run, Pacific Coast to Northern Europe, put in at California ports; Capt. G. Ahlmann, commodore of the fleet, is skipper.

HALL-YOUNG CO., Fishermen's Wharf, San Francisco, distributors of Gray Marine and Lister-Blackstone diesels, has been appointed Northern California distributor for the Westinghouse line of pneumatically operated marine clutch and engine speed controls.

FOR AN HD-19 Allis-Chalmers tractor used as a pusher on project near Indio, Calif., by H. B. Adair Construction Co., of Gardena, Calif., a new 215-hp. Buda diesel for re-powering.

FROM CUMMINS SERVICE & SALES, Los Angeneles, two 100-kw., NHS, 6-cylinder Cummins diesel-generating sets for North American Aviation, Inc., Los Angeles, to power special equipment for the Armed Forces.

FROM STERLING SHIPYARDS, Vancouver, B.C. for Capts. Johnny Dale and Harold Hendricksen, the new 74-ft. combination seiner *Ocean Pride*, powered with a 275-hp. Caterpillar diesel engine.

FROM Buda Engine & Equip. Co., Los Angeles, three 6-cylinder, 50-hp. Buda engines (to operate on sludge and LP gas) to drive positive rotary blowers at El Cajon sewage disposal plant; cooling by a Vapor Phase installation that will also recover waste heat to provide low pressure steam to heat digester tanks.

FOR G. DIAZ, Sonora, Mexico to supply power for ice plant, a 150-hp. Murphy diesel engine, from Engine Sales & Service, Los Angeles.

TO RE-POWER a No. 6 Northwest shovel, for Essco Mfg. Co., Los Angeles, a 150-hp. P & H diesel; for use in strip-mining tungsten ore on properties near Mojave, and at Randsberg, Calif.

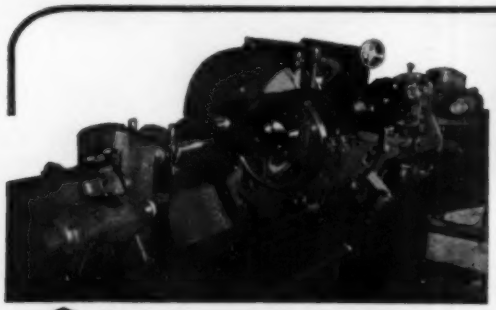
FOR THE FIRST of a series of power changeovers by Camillo Bros., Glendale, Calif., on the 20-cu.yd. rock trucks they build, a 280-hp. supercharged, Buda diesel engine.

PURCHASED BY Chas. Murray and Robt. Lowry for power and lights at their gravel plant at Isabella, Kern County, Calif., a 100-kw. Murphy diesel-generating set.

FOR THE CITY of Whittier (Calif.) Water Dept. to power a Wintroath deep-well turbine pump, a 75-hp. Buda natural gas engine, supplementing two 200-hp. Buda's previously installed for pumping.

TO SUPPLY power for Civil Defense emergencies in the city of South Gate (Calif.) a portable unit on rubber-tired trailer composed of a 300-hp., 8-cylinder Buda diesel engine direct-connected to an Electric Machinery 150-kw. ac. generator.

FROM THIRD INTERIM REPORT on Los Angeles County smog problem by Stanford Research Institute—out of a total of 48,000 tons of material burned daily in Los Angeles—materials which contribute to smog—diesel fuel consumed by trucks, busses, etc., amounts to but 260 tons—other contributors—Fuel Gas, 20,400 tons; Gasoline, 10,500 tons; Refuse, 9,165 tons; Fuel Oil, 7,300 tons.

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9 STAR BUILDING LONG ISLAND CITY 1, N. Y.

LAUNCHED IN February at Burrard Shipyards & Engineering Works, Vancouver, B.C., the M.V. *Cloverleaf*, powered with a P6 supercharged Union diesel (750-hp. @ 500-rpm.), for British Columbia Packers, Ltd.

FROM ENGINEERING CONTROLS, INC., Los Angeles, a Vapor Phase unit for cooling two 120-hp. Caterpillar diesels (utilizing steam turbine fans for cooling and condensing) hooked to 100-kw. generators driving pumps that force water into old wells to drive oil away to other points where new, shallow wells are drilled; located near Casey, Ill. at Geo. Hammond's oil well water-flooding project.

COMING DIRECTLY from Caterpillar Tractor Co. after 4½ years in service and sales capacities, Waldo Mordini has joined the sales staff of Interstate Tractor & Equip. Co., Portland, (Oregon Caterpillar distributors) to work under Sales Mgr. Geo. J. Altstadt.

POWERED with a 165-hp. GM diesel engine from West Coast Engine and Equipment Company is the new 40-foot combination boat *Tommy Roy* built by A. Mauricio, Fort Bragg, Calif., for A. Crivello, Monterey.

### Promoted to Managership

Stephen A. Keller has been named general manager of the Valve Division of Minneapolis-Honeywell Regulator Company. He succeeds James H. Binger, who will continue as vice president of the division. Mr. Keller has full responsibility and authority for all phases of the division's activities with the exception of sales, said the announcement from Mr. Binger's office. He will coordinate sales projects with production, engineering and orders. H. R. Knoblauch will continue to direct sales activities. The new general manager joined the Valve Division in February of last year. Previously he had been with Wright Aeronautical Corporation for ten years. While with Wright he held supervisory positions in manufacturing and industrial engineering. Mr. Binger also made known that Howard MacDoald, who has been chief industrial engineer, succeeds Mr. Keller as the division's plant superintendent. Robert W. Davenport succeeds Mr. MacDonald as chief industrial engineer.

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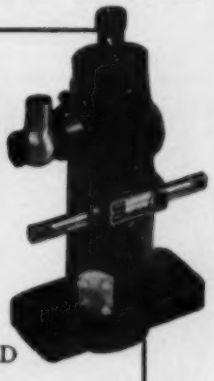

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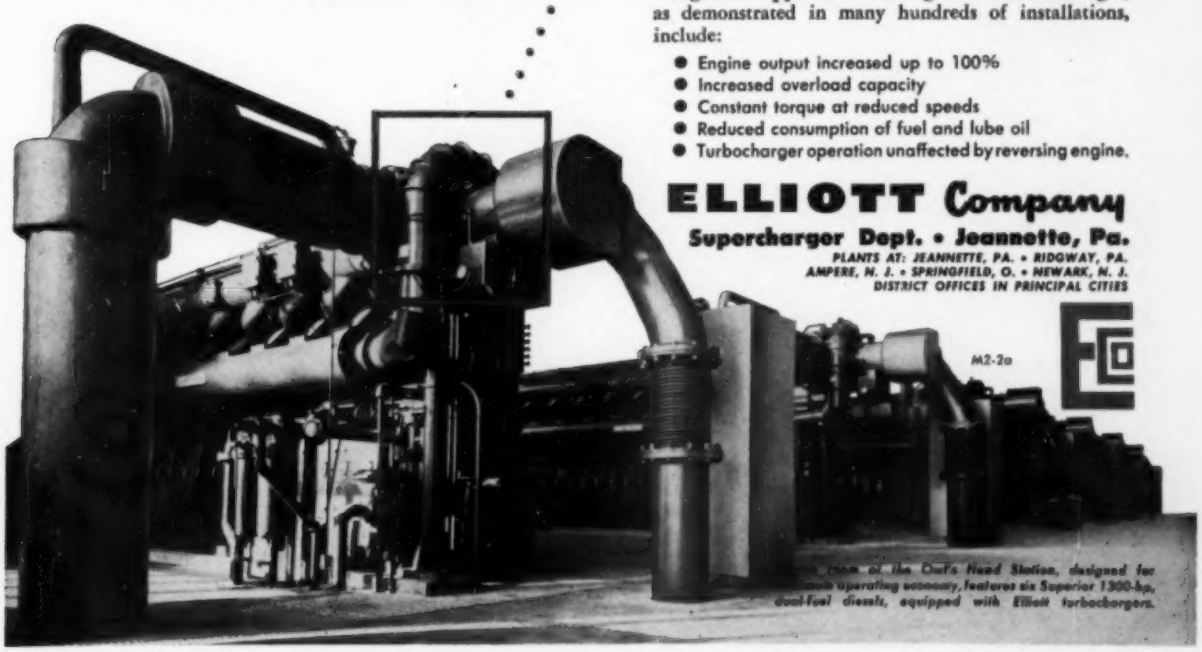

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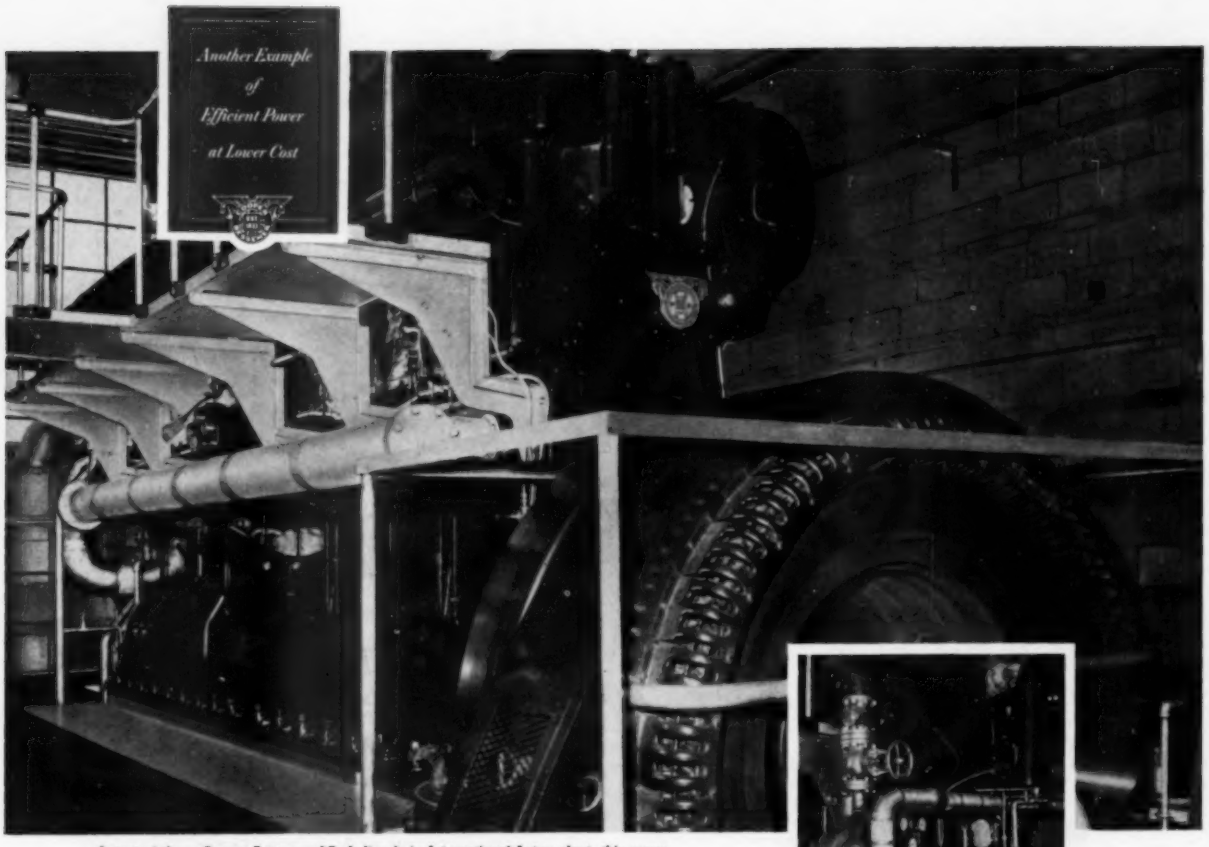


Latest of three Cooper-Bessemer LS-8 diesels in International Latex plant, this supercharged 1700 hp unit provides 40% thermal efficiency. End view at right shows piping setup for jacket water heat recovery contributing to 80% over-all thermal efficiency.

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